CONDITIONS FOR EFFECTIVE USE OF COMMUNITY SUSTAINABILITY INDICATORS AND ADAPTIVE LEARNING

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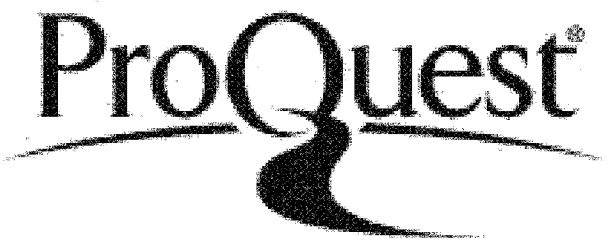

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Abstract

As the number of community sustainability indicator programs (SIPs) increases in many regions of the world, including in the United States, questions continue to arise regarding how decision makers can use sustainability indicators (SIs) to contribute in a meaningful way to their efforts to build resilient and sustainable communities. Through an analysis of the sustainability activities in sample cities from across the U.S. and a case study of one city that adopted SIs but has yet to implement them, this study seeks to uncover the conditions for effective SI implementation and use.

The study began with a review of the literature on communities' sustainability efforts and the historical roots of sustainability and resilience theory leading up to today's sustainability indicator projects. A heuristic model for adaptive learning is presented to illustrate the relationships among sustainability, resilience, and administrative concepts, including the goals and domains of sustainability indicators.

The study's data collection and analysis began with an Internet-based investigation of 200 U.S. cities. A five-tiered system was devised to categorize findings regarding sustainability patterns and trends in studied cities, ranging from an absence of sustainability activities through fully implemented sustainability indicators. The second phase of data collection employed an electronic survey completed by informants from a 38-city sample of the 200 investigated cities, followed by phone interviews with informants from cities that ranked high for developed sustainability programs. A case study using focus group research was then conducted of one small U.S. city, Juneau, Alaska, where local government adopted sustainability indicators in the 1990s but fell short of implementing them.

Most cities in the U.S. have not developed sustainability indicator projects, and, among those that have, few have been able to implement them fully. Among highly ranked cities with sustainability indicators, several approaches, including innovative organizational structures and adaptive learning processes, were found to be present. Recommendations for incorporating such innovations and for grounding sustainability indicator projects in sustainability science, resilience thinking, and public administration

theory are offered to help ensure sustainability indicators become fully operational in Juneau, as well as in other communities seeking to establish successful sustainability indicator programs.

Table of Contents

List of Figures

Page

List of Tables

List of Appendices

Page

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Chapter 1: Introduction

1.1 Purpose Statement

As the number of community sustainability indicator programs (SIPs) increases in many regions of the world, including in the United States, questions continue to arise regarding how decision makers can use sustainability indicators (SIs) to contribute in a meaningful way to their efforts to build resilient and sustainable communities. Working from the assumption that community SIs can be useful in promoting adaptive governance, this study sought to identify the conditions that facilitate the implementation and use of community sustainability indicator programs. Through an analysis of sustainability activities occurring in sample cities from across the U.S. and a case study of one city that adopted sustainability indicators but has yet to implement them, this study uncovered the conditions for effective SI implementation and use.

1.2 Personal Vignette

As an accredited observer representing the Northern Forum Organization from Alaska at the 1992 United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro (commonly referred to as the "1992 Earth Summit"), I met with representatives of nongovernmental organizations and governmental officials to discuss the need for a new era in sustainable planning at the local level, as conceptualized in chapter 28 of the United Nations Agenda 21, a voluntary agreement adopted by 178 governments at the summit (UN Agenda 21). Soon after returning home to Juneau, Alaska, five other local residents and I formed a task force under the auspices of the Juneau Chamber of Commerce to develop community sustainability indicators for Alaska's capital. Model sustainability indicators had been suggested in chapter 40 of Agenda 21 as a means of integrating sustainability into planning at the local level. In a series of meetings, our group completed the drafting of Juneau's SIs, after which they were formally adopted by the City and Borough of Juneau Assembly ("Assembly") as an Appendix to the borough's 1995 Comprehensive Plan.

Later, as an elected member of the Assembly and, for much of my term, as the appointed Deputy Mayor, I was asked to consider a wide range of controversies. The

array of issues the Assembly faced changed constantly, involving such matters as employee health care, schools, roads, land use, and employment. City staff helped with our decision making by providing background information on the various matters as they arose. Subjects considered at the Assembly level were usually controversial or could not be easily disposed of by the City Manager or other staff. Though Juneau's sustainability indicators remained appended to the city and borough's comprehensive plan for most of the time I served on the Assembly, no action on the indicators was brought before the Assembly by city staff.

As the principal legislative and policy making body for the city, the Juneau Assembly bears ultimate responsibility for the interests of the community, integrating local values and other information into its decisions. Positioned at the intersection of economic, social, and environmental issues, the Assembly endeavors to achieve not perfect governance but what Chapin (2009) has termed the "Art of the Possible."

During my term on the Assembly, a solid majority of members self-identified as "pro-development." This group, correctly perceived by their constituents and co-members to support development interests, enjoyed a high degree of unity. This dominant norm, which favored fairly unfettered resource development, created a power structure on the Assembly within which any discussion of environmental concerns, much less sustainability or sustainability indicators, would likely be unwelcome. During this period, not only were very few models available to guide a city like Juneau through the process of implementing sustainability indicators, but there was as yet little support for the city expending staff or other resources on sustainability-related activities. In this political environment, I was apprehensive about using terms or advocating vociferously for causes that might isolate me on the opposite end of the political spectrum from the Assembly's majority, with little potential for realizable gain. I perceived early on that to present as a moderate and level-headed member with a flexible attitude toward policy decision making would mark a more judicious path across the political terrain on which I found myself. I learned to select my issues carefully and to develop strategies for garnering the necessary support before bringing those issues to a vote. Under these conditions, it made

little sense for me, as one lone assembly member who strongly supported sustainable planning, to push to operationalize the adopted but dormant sustainability indicators I had helped to draft.

In retrospect, during my tenure on the assembly, I believe four general factors impaired the Assembly's action on Juneau's SIs: 1) "sustainability" and "sustainability indicators" were terms not yet well-defined that lacked meaning in common usage; 2) sustainability indicators were of little interest or counter to the interests of a majority of Juneau's elected leaders; 3) sustainability proponents lacked models to draw on in lobbying for an implementation plan; and 4) no local government entity was charged with overseeing implementation of the SIs following their adoption as part of the borough's comprehensive plan.

Today, at the same time as communities across the country have begun to formulate and implement sustainability indicators, the local policy climate has warmed to issues surrounding sustainable planning. A renewed effort is now underway to resurrect and refine Juneau's dormant sustainability indicators. As this new effort begins, members of the public and government officials will be looking to find effective means for not just drafting SIs but for implementing an effective sustainability program that will find a place in local decision making. What are some models in the U.S. that are being used to formulate and implement SIs? Are SIs playing a role in improving communities' triple bottom lines – economic, environmental, and social? What barriers have other communities faced in developing SIs and how have they surmounted those barriers? What are some attributes of successful sustainability indicator projects in communities where the projects are playing a meaningful role in local planning? Through this study, which arose out of my personal experience with Juneau's SI process, I seek to assist local activists and government staff in finding answers to these questions as they begin the task of deploying an effective sustainability indicator project.

Over my nine years as a decision maker on the Assembly, I was impressed by the lack of any integrative mechanism for monitoring interactions among the broad array of subjects that elected representatives and government officials were charged with

overseeing. In meetings of the Assembly as a whole and in committees, issue after issue would be brought before us with little or no contextual background provided. I was concerned not only about the lack of information on how programs relate to one another, but by the overall lack of a systems approach to decision making. What would be the effects of a decision on other programs; i.e., would another program be positively or negatively affected by the decision? What trends were developing within and among programs? Would the decision support or impede identified trends? Each decision was made largely in isolation from the next. When impacts or consequences to other city programs or community issues occurred as an outcome of a decision, if not overt they appeared often to go unidentified; in any event, these kinds of cross-effects would rarely be discussed at the Assembly level. In the absence of any kind of integrated indicators, in making decisions, my fellow Assembly members and I relied on general instinct, staff reports, periodic economic and social indicators provided by the State of Alaska, and general information gathered *ad hoc* from the community.

One of the few planning occasions on which multiple programs were formally considered at one time occurred when the Assembly reviewed the City Manager's annual budget document, which provides trend information, program performance updates, and workload data for each program in a single document. However, the budget document even for a town of 31,000 tends to be several hundred pages long and much too detailed for comprehensive analysis by Assembly members. We therefore lacked any accessible, holistic tool that would have provided a suite or dashboard of indicators to identify major economic, environmental, and social drivers and trends affecting the community across sectors and time.

I regularly found myself wondering if there might be some other means for tracking positive and negative, short and long-term trends across all of the city's major issues—some kind of integrated display that staff and Assembly members could refer to when making day-to-day decisions. Given my experience with sustainability indicators, I began to think about the role SIs could play as an adaptive governance tool and how they could be implemented to promote a more holistic approach to local governance in

general. My search for answers to these questions and for specific tools that might help inform decision makers as to the broader and longer term ramifications of their decisions led me to pursue a PhD in 2006, culminating in this dissertation.

1.3 Research Questions

My research sought to understand the role of SIPs in building resilient and sustainable communities. The literature on sustainability suggests that SIPS play a useful role (Moldan & Dahl, 2007), and there is evidence in the literature that these programs are expanding (*see, e.g.,* Int. Inst. Sustain. Dev., 2000, cited in Parris & Kates, 2003). Based on these assertions, I posed the following questions:

- Which U.S. cities currently have SIs, and what role, if any, do sustainability indicators and sustainability indicator programs play in cities that are actively engaged in sustainability planning?
- To what degree, if any, are cities that have developed sustainability indicators programs integrating indicators into ongoing program planning, monitoring, and reporting? What are some of the facilitating conditions and barriers to effective SI implementation?
- How do the experiences of communities with sustainability indicator programs inform the development and implementation of successful sustainability indicator programs in other communities?
- Why weren't sustainability indicators implemented in Juneau, Alaska?
- What are the general conditions for SIs to be developed and implemented in the U.S.?

1.4 Overview of Methods

The study consisted of three main components: 1) an online investigation of 200 U.S. cities; 2) a survey of 38 of those 200 cities; and 3) a case study (*see* Figure 1.1).

The first stage of the research involved the online investigation of a proportional stratified random sample of 200 communities, drawn from 645 communities in the United States included in the 2009 report of the Smarter Cities Project of the Natural Resources Defense Council (NRDC).

That part of the research was followed by a written questionnaire deployed using the Internet-based Survey Monkey to gather data from informants in 38 of the 200 cities. Telephone interviews were then conducted with officials from three cities chosen from among the 38 based on their high ranking by the Smarter Cities Project and/or on a five tiered ranking system developed in the first part of this study. Responses to the surveys were tested statistically.

The study culminated in a review of the process surrounding development and implementation of sustainability indicators in one city—Juneau, Alaska—wherein qualitative data were gathered from three focus groups comprising a total of 21 local experts and synthesized using data reduction software and techniques. Focus group input, together with other gathered data and information, served as the primary sources for the Juneau case study.

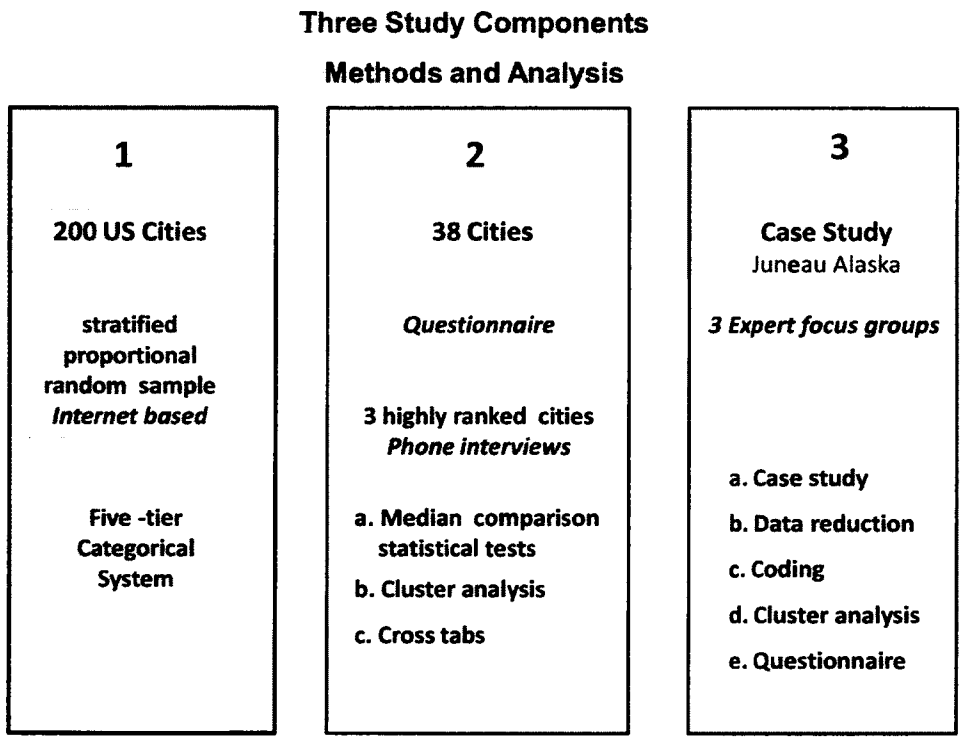

Figure 1.1 Three Study Components and Methods for Each

1.5 Organization

The dissertation is organized into eight chapters. Following this introduction, chapter two defines terms and presents a short review of the dissertation's theoretical underpinnings, followed by a review of the literature on sustainability. The literature review traces the evolution of sustainability theory, beginning with its earliest origins, continuing up through the environmental movements of the 20th century to today's community sustainability indicator projects and programs. The second part of the literature review focuses on the interrelationships among some of the concepts and theories most often associated with community sustainability indicators, including resilience thinking, adaptive governance, and administrative theory.

Chapter three presents a conceptual model for an Input-Process-Output (IPO) framework for sustainability indicator programs. This heuristic flow model illustrates the relationships among the various resilience and sustainability concepts. It also shows the flow of information in a SIP process, thus providing a model for community adaptive learning. Each of the components of the model and the relationships among components are then explained.

Chapter four presents the results of the Internet investigation of city websites and other materials on each of a broad sampling of 200 cities randomly selected from the Natural Resource Defense Council's 2009 "Smarter Cities" list of 645 cities. The objective was to gauge the extent to which communities across the country are engaging in sustainable planning in general and, among those that are, how many are using sustainability indicators. The chapter identifies the degree to which each of the cities is engaged in sustainability-related activities, including their use of sustainability indicators, and ranks degrees of activity in a five-tier system ranging from "Absent" to "Monitored."

Chapter five synthesizes results of an electronic questionnaire completed by officials from a 38-city subsample of the 200 cities investigated in chapter four (n = 200) found to be engaged in sustainability-related activities. Follow-up telephone interviews were conducted with officials from three cities that the research revealed to be high sustainability performers. The results of the telephone interviews were then analyzed to

identify performance attributes associated with each city's high sustainability ranking. A discussion of these attributes is presented in chapter six.

Chapter seven contains a case study of the stalled use of SIs in the City and Borough of Juneau, Alaska. The case study is based on participant observation, documents, and data gathered from focus groups to understand why sustainability indicators were not implemented. Based on this case study and the overall research findings of this dissertation, conditions for developing and implementing sustainability indicators are offered in support of Juneau's future SI efforts.

The final chapter summarizes the findings of the dissertation, presents general conditions for successfully implementing sustainability indicators, and suggests future research on sustainability indicators and sustainability indicator programs.

1.6 Limitations of Study

One limitation of the study concerned the small sample size of cities in chapters four and five; this was addressed by using standard sample size determination and randomization. Another limitation involved a degree of subjectivity in the focus group research reported in chapter seven owing to my experiences as summarized in the personal vignette in chapter one, my selection of the 21 focus group members from the limited pool of qualified potential participants from my community, all of whom were known to me, and the relatively small total number of focus group participants. As a resident of Juneau and former member of the city Assembly, including as Deputy Mayor, and as a significant actor in the development of the initial list of sustainability indicators in 1994, I recognized the potential for personal views to influence the Juneau case study results and addressed this potential by using random statistical approaches to select cities for comparison and by using statistical software to analyze qualitative data generated in the focus groups.

I attempted to abate any potential hazards related to my personal selection of expert participants by establishing three categories of experts – elected officials, city administrators and managers, and members of the Juneau Commission on Sustainability (JCOS). Although the number of members in the three focus groups and the number of

sessions conducted were constrained somewhat by time limitations, commonalities in the substance of the discussions of the three separate groups indicated the number of participants and amount of time allotted were sufficient to gather a good supply of data for the case study.

Chapter 2: Theoretical Basis for Study of Sustainability Indicators and Sustainability Indicator Programs

2.1 Introduction

This chapter defines the study's key terms, explains the dissertation's use of community as its unit of analysis, and surveys literature relevant to local sustainability indicators, including theoretical concepts relating to sustainability, resilience thinking, adaptive governance, and administrative theory. These theories and concepts and their interrelationships are illustrated further in chapter three as components of a heuristic graphic using an Input-Process-Output (IPO) model. The literature review in this chapter surveys relevant theories associated with sustainability, SIs, and SIPs. These concepts form the theoretical grounding for the core research questions of this study.

2.2 Definition of Terms

Faber et al. (2005) located more than 50 definitions and circumscriptions of sustainability in use in the available literature on sustainability. The terms "sustainable development" and "sustainability" are routinely used interchangeably. Although there remains disagreement over how best to define "sustainable development," the concept almost always includes the conservation of nature, deliberate commercial development, intergenerational and intragenerational equity, and concern for the future (Lumley, 2003). At the core of sustainability thinking is an ethical imperative—to provide to everybody everywhere at any time the opportunity to lead a dignified life in any person's respective society (Moldan & Dahl, 2007). Sustainability is essentially an anthropocentric concept of sustained intergenerational and intragenerational justice (Grunwald et al., 2001, cited in Moldan & Dahl, 2007), claiming for humans the right to a dignified life (Littig, 2001). Its definition largely dependent on the situation in which it is being used, sustainability is a normative (value-based) concept best considered within contextually oriented goals and objectives.

A look into the literature on the evolution of sustainability concepts leading up to the 21st century finds that, among the many definitions of "sustainability," most depend on context. Ecologists, economists, sociologists, and biologists, to name but a few

disciplines working with sustainability, have their own unique perspectives on how to define the term. Across disciplines, the topics of nature economics, well-being, types of capital, natural resource depletion, ecosystem services, temporal and spatial concepts, and resilience theory are all considered relevant to discussions of sustainability.

Generally, the literature defines sustainability as the effort to achieve a balance or equilibrium between three broad objectives: maintenance of economic growth, protection of the environment and prudent use of natural resources, and social progress that recognizes the needs of everyone (Custance & Hillier, 1998; Walter & Wilkerson, 1998).

In "Our Common Journey: a Transition toward Sustainability," The National Research Council (1999) defines sustainability indicators as:

> repeated observations of natural and social phenomena that represent systematic feedback . . . [and] provide quantitative measures of the economy, human well-being, and impacts of human activities on the natural world. The signals they produce sound alarms, define challenges, and measure progress . . . Generally, indicators are most useful when obtained over many intervals of observation so that they illustrate trends and changes. Their calculation requires concerted efforts and financial investments by governments, firms, nongovernmental organizations, and the scientific community. (p. 234)

Two key acronyms appear repeatedly in the NRC study: SI (sustainability indicator) and SIP (sustainability indicator project). The term "sustainability indicators" refers to a collection of specific measurable characteristics of society and nature that address social, economic, and environmental quality (Reed et al., 2006). SIs are distinguishable from simple environmental, economic, or social indicators by the way they are integrated and developed with input from multiple stakeholders (Maclaren, 1996). SIs may or may not be associated with a single domain or across domains, but they are "sustainable indicators" because they are seen as part of a suite of indicators that describe the state of the system as related to sustainability and community goals. The term "sustainability indicator project" is defined as various activities undertaken by

communities to formulate and deploy sustainability indicators. In this dissertation, the term "sustainability indicator program" is used to describe programs charged with sustainable planning and the activities of those entities. These terms are further defined and discussed in the following literature review.

Another key term used in this study is "holistic." For the purposes of the dissertation, "holistic" means the integration of social and ecological domains; more specifically, within the realms of sustainability indicators, projects, and programs, "holistic" refers to the integration of economic, environmental, and social domains.

The term "dashboard" herein refers to a display of a suite of key indicators organized under several sustainability domains, such as economic, social, environmental, public policy, or technology, and presented in a succinct, highly readable, often digital, fashion. "Dashboards" have been widely adopted to present and monitor relevant information in a timely manner in order to measure ongoing progress toward achieving key strategic objectives (Eckerson, 2006).

2.3 Community as Unit of Analysis

The unit of analysis and sampling for this dissertation is community. Because community size and composition affect how sustainability indicators are developed and used, it is important to define community by including characteristics and bounds. The term "community" is described in both the community development and natural resources literature (Magis, 2007). Herein, Magis' definition will be used; to wit, a social grouping of people residing in a specific geographic territory. Community characteristics include a sense of place, a level of commitment among community members to their common well-being, the ability to collaborate to solve problems, and access to resources (Chaskin, 2001). Under Magis' definition, community denotes a particular history and specific demographic patterns and contains houses, industries, and organizations.

Linking the concept of sustainability to concepts of community has particular advantages, since communities represent the social and physical expression (social-ecological system) of interdependence (Mazmanian & Kraft, 2001). A correlation between scale and the extent of the problem being addressed has been suggested by Dietz

et al. (2003) who argue that information (i.e., indicators) needs to be collected and modeled both on local and other scales and used in making policy at the appropriate scale. Spatial aspects of a community, large or small, determine the types and importance given to each indicator. What we call "community" in fact represents a fundamentally open system that is nested within a larger open system (I. Show, personal communication, December 15, 2009). Political boundaries rarely match the biophysical boundaries circumscribing issues such as transboundary pollution and game management.

Community and traditional concepts of scale are becoming redefined with the rapid increase in the number of "world cities." World cities, as described by Ng and Hills (2003), are cities that have developed as a result of international trade. Examples include New York, Shanghai, Hong Kong, and Paris. Mee Kam Ng believes that large cities and world cities are just as vulnerable to the development of ecological and social problems as small cities (2003). In this dissertation, "community" applies only to cities in the United States. The term will be used interchangeably with "city" and includes different scales, ranging from small to large communities within which people reside under the jurisdiction of a common government.

2.4 Literature Review

The following literature review traces sustainability thinking from some of its earliest iterations up through today's sustainability indicator programs and includes a brief discussion of three modern sustainability indicator success stories.

2.4.1 Ancient roots of sustainability's concepts and theories

The literature on sustainability concepts includes writings dating back to the economists, scientists, and philosophers of the 17th and 18th centuries (Sharpe, 2004). Western thought regarding sustainability can be found much earlier, though, in the early writings of Aristotle, who argued in *Nicomachean Ethics* that wealth is not the good we are seeking; it is merely useful for the sake of obtaining something else (Sharpe, 2004). Concepts about nature and human relationships with nature remained fairly constant from the 19th century through the Industrial Revolution (Lumley & Armstrong, 2004). An abundance of literature was produced during that era aimed at improving the human

condition and recognizing humanity's dependence on nature (Lumley & Armstrong, 2004).

The notion of economic sustainability is firmly embedded in the writings of Mill and Malthus (Lumley & Armstrong, 2004). Mill emphasized that environment (nature) needs to be protected from unfettered growth if we are to preserve human welfare in the face of the law of diminishing returns. Malthus emphasized the pressures of exponential population growth on the finite resource base and its effects on inequities between the rich and poor. These thinkers influenced each other and were also influenced by earlier writings, such as those of Adam Smith. For these philosophers, conserving nature while trying to improve the distribution of wealth was not a paradox, but a moral duty (Lumley, 2003). For example, Smith's rational pursuit of self-interest could only be followed if it did not interfere with "the rules of justice." The ideas of Mill, Malthus, and Smith sought to promulgate just and practicable economic, environmental, and social policy (Lumley, 2003). As the industrial revolution progressed into the 20th century and developed countries industrialized, ensuing environmental degradation from a lack of environmental management would eventually lead to increased environmental awareness.

Prerequisite to establishing a successful sustainability program, governments must build local consensus on the definition of not only the term "sustainability," but the main concepts and theories that surround sustainable planning.

2.4.2 Advent of community indicators in the 19th and 20th centuries

Literature portending today's sustainability indicators began to emerge in the early 1900s, with indicators or benchmarks designed to measure overall community well-being (community indicators) and aspects of that well-being, such as social and environmental variables. These writings formed the foundation for sustainability-specific literature that began to appear in the late 1980s, as well as recent writings on resilience thinking, adaptive governance, and administrative theory.

Literature on community-level measurement for balancing social-ecological (environmental, economic, and social) systems began to emerge in the 1980s and 1990s (Gahin & Paterson, 2001). Commonalities can be found among the writings on well-

being, quality of life, and the sustainable community movement in that all share an interest in developing and using community indicators to collect data on which to base discussions and decisions.

According to Gahin and Paterson (2001), indicators, in their most general sense, are useful to describe current conditions, to track trends over time, and to identify important issues. Patricia Cohen, in *A Calculating People: The Spread of Numeracy in Early America* (1999), concluded that for society in the 19th century "what was counted was what counted." Cohen describes early efforts to develop indicators centered on community public health data, such as demographic data, unemployment rates, crime rates, and consumption levels (Cohen, 1999, cited in Cobb & Rixford, 1998). For example, a study released by the Russell Sage Foundation in 1914, based on a survey of industrial conditions in Pittsburgh, Pennsylvania, provided an early precursor to the community indicators efforts of the 1990s (Cobb & Rixford, 1998).

The Russell Sage Foundation study sparked a wave of interest in other cities and led to more than 2,000 local surveys on education, recreation, public health, crime, and general social conditions (Gahin & Paterson, 2001). The National Bureau of Economic Research, founded in 1920, established a research committee on social trends, which released the 1,600-page *Recent Social Trends in 1933*, focusing mostly on social and educational indicators (Cobb & Rixford, 1998). Researchers, in a seminal publication sponsored by NASA titled *Social Indicators* and published in 1966, noted that to "understand second-order effects on social, political, and economic life a broad set of measures was needed" (Gahin & Paterson, 2001).

The literature on social indicators from the 1960s indicates that efforts were attempted by Congress to guide public policy through the use of social indicators, but the method was never adopted (Gahin & Paterson, 2001). At the time, critics of social indicators argued that these data were not as useful as economic indicators because social theory was not as well-developed as economic theory and, also, that social objectives were fuzzy (Cobb & Rixford, 1998). However, the literature on social indicators began to increase in the 1960s and 1970s with the advent of the *Journal of Social Indicators*

Research, founded in 1974, after which work on social indicators "bloomed" (Sharpe, 2004), with thousands of books and articles on the topic published (Cobb & Rixford, 1998).

Three main areas where social indicators began to be applied at the city scale during this era involved geographical divisions and population, interurban (measures to compare and contrast cities), and performance delivery (Gahin & Paterson, 2001). Quality of life studies, state of the cities reports, and various academic publications experimented with economic and social indicator reports at the local level during the 1970s (Sawicki & Flynn, 1996). In the 1980s, social indicator activity slowed considerably, as governments in the United States and other countries, as well as international agencies, cut support (Sharpe, 2004). Cobb and Rixford (1998) note that by the 1980s the social indicator movement in the United States had waned and would not rise in importance again until the 1990s. Judith Innes' oft-cited 1990 book on measurement and social indicators, *Knowledge and Public Policy: The Search for Meaningful Indicators*, states that while major decisions are surrounded by facts and analysis, it is difficult to pinpoint the effects of indicators. Innes concluded, however, that under certain conditions indicators could be pivotal to policy debates or integral to administrative decision making. Overall, from the literature from the mid-20th Century related to social indicators, it is clear that social indicators expanded the range of quality-of-life indicators beyond traditional economic markers during this period (Sharpe, 2004).

2.4.3 Emergence of environmental indicators in the mid-20th century

Several influential books written in the late 1940s and 1950s questioned the ability of the earth to sustain a growing population. Literature that raised awareness and concern for environmental issues began to build in the 1960s, beginning with the publication of Rachel Carson's influential work *The Silent Spring*, published in 1962. A great deal of literature about population growth and the environmental limitations of prevalent patterns of economic growth appeared in the 1970s and 1980s (Gahin & Paterson, 2001). In 1981, the Environmental Protection Agency published *Environmental Trends*, which included indicators to monitor and publicize the state of

environment (Cobb & Rixford, 1998). Another example of the increasing number of popular environmental indicator publications is found in the Worldwatch Institute's annual State of the World reports, which present data based on environmental and social indicators (Worldwatch Institute, 2004). Most recently, and on a global and sub-global scale, ecosystem assessments were reported in the World Health Organization's 2005 Millennium Ecosystem Assessment (MA). The MA introduced a new framework for analyzing social-ecological systems that has had wide influence in the policy and scientific communities. Researchers Carpenter et al. (2009) suggest a framework for assessing changes in social ecological systems by using metrics and indicators that can be collected consistently and compared across the range of cases.

2.4.4 Origins of sustainability indicators

The roots of community sustainability indicators can be traced to the Stockholm Conference on the Human Environment in 1972 (Ward & Dubos, 1972). The concern about human effects on the environment continued from Stockholm and was reflected in the recognition of the growing disparity between the rich and poor nations in the *North-South Brandt Report* (Brandt, 1980) and the *Report to the President* (Barney, 1980).

Although several landmarks line the path to our current definitions of sustainability, the 1987 Brundtland Report constitutes the most significant reference on this term. The report both popularized and helped to define sustainability as "development that meets the needs and aspirations of the present without compromising the ability to meet those of the future" (para. 49). Following the presentation of this definition, discussions regarding how to plan for sustainability began to broaden, with new definitions appearing and continuing to evolve into the 21st century. Since the appearance of the Brundtland Report more than two decades ago, the term "sustainability" has been discussed extensively.

The United Nations Conference on Environment and Development (UNCED), or "Earth Summit," held in Rio de Janeiro in 1992, presented a framework for writing community sustainability indicators. In chapter 40 of "Local Agenda 21," a part of the agreement that came out of the summit, it is acknowledged that "commonly used

indicators such as GNP and measurement of individual resource or pollution flows do not provide adequate indications of sustainability." The chapter goes on to state that "indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems." Since the time that statement was published, a massive literature on sustainable development (Moffatt, 1996, cited in Moffatt et al., 2001) has accrued. The academic and policy literature on sustainability indicators is now so prolific that King et al. (2000) have referred to it as "an industry on its own" (quoted in Reed et al., 2006, p. 406).

2.4.5 Sustainability indicators distinguished from other indicators

Maclaren (1996) stated that sustainability indicators, which measure conditions in time and space, are distinguishable from simple environmental, economic, or social indicators by the fact that they are integrated and developed with input from multiple stakeholders in the community. Indicators of sustainability aid in defining and measuring the characteristics or processes of human environmental systems to ensure continuity and functionality far into the future (Moldan & Dahl, 2007). Sustainability indicators must be credible (scientifically valid), legitimate in the eyes of users and stakeholders, and salient or relevant to decision makers (Hak et al., 2007).

Sustainability indicators are needed in today's world because measures such as GNP alone no longer adequately reflect the complexities of economic and social systems (Moldan & Dahl, 2007). By the same token, as Walter and Wilkerson (1998) point out, SIs are concerned with sustaining certain conditions and assets within a community and often do not adequately recognize the inherent dynamic, interdependent, and complex nature of natural and anthropogenic change. In early use of SIs, communities focused on definitions and the identification of indicators to be used to measure a sustainable system.

Hundreds of local communities responded to the call in Agenda 21 to address sustainability by developing local sustainability indicators—over 289, local or metropolitan in scope (Int. Inst. Sustain. Dev., 2000, cited in Parris & Kates, 2003). Local

sustainability indicators have moved from fairly static definitions of what sustainability should be to a more dynamic approach.

Measures of community well-being such as the gross national product (GNP) and human development index (HDI) at best provide a single measure of current well-being (Dasgupta, 2007). In addition to Dasgupta, several other researchers (*see e.g.*, Arrow et al., 2004) have argued that a separate index is needed to track current policies for their consistency with sustainable development. Dasgupta suggests that the "productive base" helps to bridge economic progress and other community dynamics by measuring economic indicators as well as the condition of different forms of capital. A community's "productive base" includes both its institutions and capital assets.

Institutions are different from capital assets in that the former comprise the social infrastructure (e.g., laws, property rights, beliefs, extent of trust among people) for guiding the allocation of resources, including the capital assets themselves. Capital assets encompass not only manufactured capital (roads, building, machines), human capital (education, skills, and health), and publicly available knowledge (science and technology), but also include natural capital (e.g., minerals, oil, and natural gas; fisheries; forests; soil resources—or, more generally, ecosystems) (Dasgupta, 2007). SIs may be used to better frame criteria such as capital assets, inclusive wealth, and institutional health.

2.4.6 Examples of SIs and SIPs first used in the U.S.

Several communities of the U.S. have developed and are today using sustainability indicators. These include Jacksonville, Florida; Santa Monica, California; Truckee Meadows, Nevada; and Seattle, Washington, briefly discussed below. All developed sustainability indicators in the late 20th century and all are still actively working with indicators. Important lessons can be gleaned from the experiences of these four cities—how their programs got off the ground and how they are functioning now.

Jacksonville's well-being indicators

Jacksonville initiated its sustainability effort the earliest of these four cities, in 1985 (Warner, 2006), followed by the other three, which started their work around 1995,

after the United Nations Earth Summit. First drafted in 1985, the "Quality of Life" indicators for the city of Jacksonville represent the longest-standing indicator of this type (Besleme, et al., 1999). Although they were labeled "quality of life" indicators, the Jacksonville indicators bear a close resemblance to what are termed sustainability indicators by others and in the literature. Initiated by the Jacksonville Community Council, Inc. (JCCI), a well-established nonprofit, the indicators seek to measure quantitatively the quality of life in northeast Florida, tracking trends in education, economy, natural environment, social well-being, arts and culture, community health, local government, transportation, and safety. They are presented in an easily accessible "dashboard" manner (JCCI, 2010) that is published periodically for public review. According to the literature, dashboards have been successful in influencing city policy (Warner, 2006).

Jacksonville's SIP, in many ways the original model for community indicator projects, incorporates public participation, a consensus process, and annual reporting (Besleme et al., 1999). With a very well organized system of participation, including subcommittees and task forces consisting of volunteers selected for their leadership skills and areas of expertise, the Jacksonville project developed nine quality of life topics, each comprising ten indicators. The indicators are publicized in local newspapers and are distributed to the community annually with an opinion survey that gathers information on community perceptions. Indicators are influenced or augmented by targets set by additional community volunteers (Warner, 2006). Annual citizen review of the indicators has led to important improvements. For example, an increase in adolescent pregnancy led to the creation of a pregnancy prevention group, which led to the establishment of a highly regarded multi-service teen center. Another example of indicators affecting change in Jacksonville is found in the quality of life indicator for "number of sign permits issued," which led to the JCCI approving an ordinance to eliminate mobile signs and to regulate on-site signs. For many years, the project was funded by organizations outside of local government, and conducted mostly by volunteers, but the city government recently decided to fund the indicator project; most importantly, the indicators are now integrated

into the city's annual budgeting process (JCCI, 2010). Consistent with one of the major points of this paper, the JCCI is about to begin a rethinking process for its indicators that will include consideration of interrelationships among indicators, as well as a factoring in of neighborhood differences (JCCI, 2010). Jacksonville's SIs are an example of adaptive learning in the sense of indicators providing an effective feedback mechanism for the general public and governance to evaluate issues and projects.

Santa Monica's Sustainable City Plan

Another example of a community indicator program that has had significant institutional influence on local governance can be found in the Santa Monica Sustainable City Plan (Santa Monica Office of Sustainability, 2011). In 1994, the Santa Monica City Council established the Santa Monica Task Force on the Environment, made up of seven citizen volunteers (Bertone et al., 2006). Working with city agencies, including the departments of Public Works and Environment, the task force established sustainability as the core guiding principle for setting city-wide environmental programs and policies. The task force effectively engaged with the public—taking its pulse with opinion surveys and seeking support for its initiatives in public presentations.

Informed by public input, the task force established eight guiding principles, assigning each to one of four major policy areas: Community and Economic Development, Transportation, Pollution and Prevention and Public Health, and Resource Conservation. Indicators were then developed under each of these headings to assess the effectiveness of the programs in the policy areas (Bertone et al., 2006). Several improvements have resulted from the use of these indicators—notably, Santa Monica has decreased its water consumption and greenhouse emissions while increasing recycling and mass transit ridership and expanding open space. All of the individual issues with indicators have shown improvement toward sustainability.

One major self-criticism found in Santa Monica's 1996 progress report card was that the sustainable policies and programs were being undertaken piecemeal by the city, but a systems approach, with increased attention paid to interrelationships among indicators may be on Santa Monica's horizon. Since the 1990s, Santa Monica's

Sustainability City Plan has become increasingly robust, with additional sectors of the sustainability added, such as human dignity and civic participation, which was most recently reported in September 2010 as part of its regular published annual reports. A new guiding principle for sustainability states the following:

> *All Decisions Have Implications to the Long-term Sustainability of Santa Monica.* The City will ensure that each of its policy decisions and programs are interconnected through the common bond of sustainability as expressed in these guiding principles. The policy and decision-making processes of the City will reflect our sustainability objectives. The City will lead by example and encourage other community stakeholders to use sustainability principles to guide their decisions and actions. (City of Santa Monica, 2012, p. 1)

Truckee Meadows partnership

For the past several decades, Nevada has been one of the fastest growing states in the country (Besleme, 1999). Perhaps that explains a statewide interest in city and regional planning. In 1991, Nevada law began to require the use of indicators in regional planning (Besleme, 1999). Early in the process, the Truckee Meadows Regional Planning Agency (TMRPA), which is charged with planning in Washoe County, developed indicators using a process that included public input, credibility checks, and financial support to ensure that the indicators guiding the County Regional Plan truly addressed citizens' needs. Today, the region's indicator project is operated through a partnership between the TMRPA and a private nonprofit called Truckee Meadows Tomorrow (TMT).

The Truckee project's stated objective is to provide information to help the government realize the goals set by the regional plan. Indicators have been used by the TMRPA as a barometer for measuring aspects of quality of life known to be valued by the community. For example, infrastructure improvements have been modified or changed based on several quality-of-life indicators (Besleme, 1999). Recently, TMT expanded its reach through an initiative termed "Adopt-an-Indicator"—a program designed to increase community participation outside of TMT's organization. Adopt-an-Indicator invites individuals, organizations, businesses, and institutions to take

responsibility for specific indicators (Besleme, 1999). With the institutionalizing of TMT as a full partner with TMRPA, the indicators have affected public policy by influencing decisions concerning such things as roads, human waste disposal, and schools.

Sustainable Seattle 1993 Indicators of Sustainable Community

The "Sustainable Seattle 1993 Indicators of Sustainable Community" ("Sustainable Seattle") was one of the first SIPs established in the United States (Besleme, 1999). It provides not only a good example of an early SIP in and of itself, but is somewhat typical of the many other programs modeled after it. The Long Island University Institute for Sustainable Development's methodological review of U.S. indicator projects reported that of the 170 sustainability projects examined around the country at least 90 used Sustainable Seattle as a model (Besleme, 1999). The Seattle example contains lessons applicable to many indicator projects that followed in its footsteps.

Sustainable Seattle was started by a nonprofit group that grew to include community activists from several different local organizations. After a subgroup developed a mission statement and a definition of sustainability based on local trends and needs, Sustainable Seattle developed a set of indicators grouped into several categories. The program proved successful in garnering widespread participation from a cross-section of the community. The indicators were first published in 1993 and were later revised in 1995 and 1998.

Unfortunately, Sustainable Seattle's indicators have yet to be integrated into decision making in a way that has brought them to bear directly on public policy. This is typical of other indicator projects that followed the Seattle model. After a quiet period in 2003 and 2004, Sustainable Seattle assembled a new group of citizens with the stated intention of finding ways to persuade government to use the indicators to effect change. The group appears to remain active; its website indicates a current focus on the development of regional indicators, the Seattle Area Happiness Initiative, and training.

Notably, the City of Seattle and King County have established an extensive citywide environmental management system inside the city bureaucracy, with many

sustainability programs that use milestones and indicators for measuring progress. The City's Office of Sustainability and Environment houses several such sustainability programs (Holden, 2006). Although there are no obvious signs of formal relationships between the City of Seattle and Sustainable Seattle's indicator project, indicator sets such as those established for King County have clearly drawn on the example of Sustainable Seattle.

The above four examples, which represent a small minority of cities that have SIPs, demonstrate how SIPS have contributed to operationalizing community sustainability by providing information to decision makers. These stories, with the exception of Jacksonville, are not included in the survey and case study that follows, however the short descriptions of these cities' efforts are intended to provide an upfront description of what some of the more advanced cities are accomplishing.

2.4.7 Characteristics of SIs internationally

Since Agenda 21, the majority of writings on local and municipal sustainability have originated outside the United States. Scipioni et al. (2009), who have reported on several international case studies, including Walter and Wilkerson (1998), Yuan et al. (2003), Hezri and Dovers (2006), and Lee and Huang (2007), have made a short list of the main features of sustainability indicators, summarized in Table 2.1.

Table 2.1 Main Characteristics of SIs. (Modified from Scipioni et al., 2009).

Feature	Description
Multi-dimensionality	Indicators must describe the different dimensions of sustainability – economy, environmental, society – with an integrated perspective. (Lindholm et al., 2007)
Guidance to Policy Making	Indicators must support decisional processes. They must support the sharing of local policy general strategies among local communities and the sharing of development goals toward sustainable development. (Hezri & Dovers, 2006)
Sharing	Indicators must support sharing of policy strategies among local communities and sharing of development goals toward sustainability (Lindholm et al., 2007)
Objectivity & Relevance	Indicators must be significant and also be an exact portrayal of the considered context. (Hezri, 2004; Fraser et al., 2006)
Context	Indicators must be coherent with goals set down by the UN Local Agenda 21 process. This is important to guarantee the efficacy and the utility of the evaluations that follow in local context. (Hezri, 2004; Hezri & Dovers, 2006)
Participation	The choice of indicators must be the result of a bottom-up process. This process ensures sharing of the measurement tool and validity of the evaluations that follow with all stakeholders. (Valentin & Spangenberg, 2000; Yuan et al., 2003; Hezri, 2004; Reed et al., 2006)

Table 2.2 shows sample indicators from Portland, Oregon, a city in the United States that has developed a sustainability indicator program.

Table 2.2 City of Portland Sample Indicators. This table lists one sample indicator for each of the five Areas of Concern that are part of the City of Portland Oregon's "Signs of Sustainability Report." The indicators listed also include other components of the SI project, including actions (paraphrased) and data sources (City of Portland Bureau of Planning and Sustainability, 2006).

Area of Concern	Indicator	Individual Actions	Business Actions	Data	Potential Data Source
Land, Air Quality, Water Quality	Native and non-invasive vegetative cover (vs. % impervious surface)	Removing hard surfaces and revegetating, preferably with native species	Removing hard surfaces and revegetating, preferably with native species	Yes	Portland Bureau of Environ. Services
Human/ Community Health	Number of children that walk & bike to school	Promote walk/bike to school with own kids	Walk/bike to school week sponsor	Yes	PDOT
Social / Economic Sustainability	Civic engagement, general social welfare	Hours of volunteering	Pay employees for volunteer time; other actions to sanction volunteering	Yes	Portland Multco Progress Board
Other concerns: energy use, air quality, emissions	Energy use per capita	Changing incandescent bulbs to CFLs; weatherization	Lighting changes	Yes	Portland Multco Progress board

2.4.8 Sustainability domains

Since the introduction of SIs, planners have been making them easier to understand and interpret by placing them within a conceptual framework, often with a hierarchical arrangement of sub-domains (Moldan & Dahl, 2007). The City of Portland's sustainability indicators shown in Table 2.2 are organized into five "Areas of Concern." According to researchers Bell and Morse, the literature on sustainability indicators falls into two broad methodological paradigms: one that is expert-led and top-down and another that is community-based and bottom-up (Reed et al., 2006). The first uses quantitative indicators explicitly and is rooted in scientific reductionism; it is usually expert-led and quantifies the complexities of dynamic systems in many fields, including biology, economics, etc. The second paradigm draws from the participatory philosophy

that is more characteristic of the social sciences (Reed et al., 2006). In his paper on adaptive learning and sustainability indicators, Reed listed 10 methodological frameworks for developing and applying sustainability indicators on a local scale and organizes the frameworks into two groups – top-down and bottom-up. Four examples of Reed's list are listed in Table 2.3.

Table 2.3 Examples of Bottom-up and Top-Down Approaches for Local SI Development. This table groups methodological frameworks into two examples of: bottom-up, community based, and two examples of top-down, expert-led approaches for developing and applying local sustainability indicators (modified from Reed et al., 2006).

Approach	Selected Examples of Frameworks	Authors
Bottom-up	1) Soft System Analysis	Checkland, 1981
	2) The Natural Step	James & Lahti, 2004
Top-down	1) Panarchy Theory & Adaptive Management	Gunderson & Holling, 2002
	2) Well-being Assessment	Prescott & Allen, 2001

Maclaren (1996) grouped indicators into five general frameworks: domain-based, sectorial-based, issue, causal, and goal-based. She describes "domain-based" frameworks as indicators that begin with the general sustainability domains (economics, environment, and society) and then groups indicators under each domain. Because Local Agenda 21 also placed indicators within these three domains, the domains have often been used to frame indicator lists. One of the examples discussed later in this dissertation, Sustainable Seattle, used these three domains, then added additional categories specific to local issues. Maclaren (1996) asserts that a domain-based framework is most effective for ensuring complete coverage of the dimensions of sustainability.

The "sectorial-based" framework, as Maclaren (1996) explains, arranges indicators by government sectors, such as transportation or public safety. Another framework used by several communities is "goal-based." As the name implies, indicators are developed according to community goals. The United Kingdom's Local Government Management Board uses a goal-based framework that includes benchmarks to measure such criteria as carrying capacity and quality of life.

The "issues-based" framework centers on the prevailing issues of the community. For example, air quality was an indicator in Juneau, Alaska, largely because of concern from cruise ship emissions. An issues-based framework is dependent on current local issues instead of predetermined realms, such as environmental, economic, and social domains.

Finally, "causal" framework refers to cause and effect relationships. The most common causal framework is the pressure-state-response (PSR) model that is used almost exclusively for environmental issues. The causal framework provides limited but important information for indicators involving cause and effect relationships. However, because these relationships often are difficult to locate on the long-range playing field of sustainability planning, most indicators do not center on PSR strategies (Maclaren, 1996).

While frameworks are useful in organizing and analyzing sustainability indicators, they lie at the root of much of the criticism that sometimes surrounds indicator lists (Walter & Wilkerson, 1998). For example, one common complaint is that in formulating SIs not enough attention is paid to quality of life issues (Moffatt et al., 2001). Several authors note that indicator projects to date have tended to exclude a number of other elements essential to community sustainability, as well (Walter & Wilkerson, 1998; Moldan & Dahl, 2007). In early projects, economic output too often served as a satisfactory proxy for quality of life (Walter & Wilkerson, 1998), but, by the late-1990s, indicators for quality of life issues had become common. At this point, though, it is safe to say that indicators based on environmental and economic variables are still most common, as these are areas where data tend to be available. Nevertheless, some critiques of indicators in the literature focus on the failure of planners and decision makers to integrate economic and environmental indicators adequately into formal analyses (Kelly & Moles, 2002). Simon Bell and Stephen Morse (2008), who have authored one of the few books on community sustainability indicators (*see also, e.g.,* Sirgy et al., 2006; Mazmanian & Kraft, 2001; Newman, et al., 2009), criticized sustainability indicators on the basis of their often-failed attempts to encapsulate complex and diverse processes in relatively few measures. Considering the all-encompassing and multi-generational nature

of sustainability, the concern that factors affecting sustainability are too complex to ever adequately measure is to be heeded. The more we compartmentalize issues and activities, the harder it becomes to see patterns of change. Though it may be impossible to completely model the system as a whole, there is general agreement in the literature that, when formulating individual indicators, the process itself can arm a community with useful information.

2.4.9 Bringing a systems approach to sustainability indicator projects

Sustainability theory and resilience theory both assume a systems approach (Karlsson et al., 2007). These theories assume that problems can be identified and solved more efficiently if, beyond examining a system's individual components, the system is treated as a holistic entity with interconnected elements. When seen as a principal component of a system, indicators serve as measurements and signals for change. "Sustainable Measures," a web-based informational and training organization working on community sustainability measures, lists the following essential functions of sustainability indicators:

- address the issue of the community's carrying capacity relative to the four types of capital: natural, human, social, and built;
- highlight the links between the community's economic, social, and environmental well-being;
- focus on a long-range view;
- are understandable to the community; and measure local sustainability that is not at the expense of global sustainability.

(Sustainable Measures, 2010)

2.4.10 The role of sustainability indicators in resilience theory

An often implied and sometimes stated goal of community sustainability planning is to sustain present conditions across the community's economic, social, and environmental domains. Early definitions of sustainability assumed an absolute and static view of the system, but a framework to analyze the concept of sustainability, proposed by Faber et al. (2005), separated the concept's components: the artifact (what), goal

orientation ("relative versus absolute"), and behavioral interaction ("static versus dynamic"). This framework is useful in categorizing different definitions of sustainability as either "static" or "dynamic." The literature since about 2002 shows that sustainability definitions and lists of indicators have moved from a static absolutist view toward a more relative, dynamic model. In other words, sustainability no longer targets an ultimate sustainable state but, instead, represents a process of constant improvement of the sustainability of artifacts with the realization that things change (Faber et al., 2005). The observations of Faber et al. (2005) reflect an emerging trend in sustainability thinking that aligns community sustainability with resilience.

Resilience theory offers a vision of sustainability not as stability but as persistence born of change (Berkes & Seixas, 2005). Resilience theory and typically related concepts of vulnerability, adaptability, and adaptive governance are discussed in an increasing number of articles and textbooks on sustainability (e.g., Chapin, et al., 2009; Folke, 2006; Turner et al., 2003; Robinson et al., 1990), while SIs have come to be seen as central to defining and measuring the characteristics or processes of human and environmental systems to ensure continuity and functionality far into the future (Hak et al., 2007). Instead of the three domains (economy, environment, and culture) traditionally used by early community groups, resilience theory examines key driving social-ecological relationships and embraces change, uncertainty, and surprises (Walker et al., 2004).

Literature on social-ecological resilience as related to communities began to appear in the 1990s. Resilience theory has since been applied to local-level systems as well as other spatial and temporal domains (Adger, 2000; Berkes & Seixas, 2005; Janssen et al., 2006; Olsson et al., 2006). For example, Walker et al. (2004) have applied the following four precepts of resilience theory to social-ecological systems. The first three can be applied either to the whole system or to the subsystems that make up the system:

1. Latitude. What is the maximum amount a system can be changed before losing its ability to recover (before crossing a threshold which, if breached, makes recovery difficult or impossible)?

2. Resistance. How easy or difficult is it for the system to change; how "resistant" is it to being changed?

3. Precariousness. How close is the current state of the system to a limit or "threshold"?

4. Panarchy. Because of cross-scale interactions, the resilience of a system at a particular focal scale will depend on the influences from states and dynamics at scales above and below. For example, external oppressive politics, invasions, market shifts, or global climate change can trigger local surprises and regime shifts.

As fundamental building blocks for sustaining social and ecological systems, local communities were recognized in Agenda 21 as best situated to resolve social-ecological issues using local knowledge (Valentin & Spangenberg, 2000), and resilience thinking is now beginning to become part of that process. Within the past five years, books published about resilience, climate change, and sustainability, such as *Resilient Cities* by Newman et al. (2009), are becoming more common. The relationship between sustainability indicators and resilience is not well developed in the literature. Considering that resilience is about change and cross-scale relationships, sustainability indicators could be used to reflect those changes and relationships.

Newman uses the Walker, et al. (2004) definition of resilience thinking, i.e., the capacity of a system to absorb disturbance and still retain its basic function and structure. Newman applies resilience to cities' complex systems, defining a resilient city as having built-in systems that can adapt to change, for example by diversifying transportation and land-use systems or establishing multiple sources of renewable power that will allow a city to survive shortages in fuel supplies.

Newman's main point is that cities need to move toward resilience by reducing their ecological footprints, especially by reducing oil dependency, arguing that the more a city can move away from oil the more resilient it will become. He presented 31 recommendations across eight strategies including leadership, partnering, decision making, transportation, and diversification of natural resources, and sets goals for zero

net greenhouse gas emissions by 2050 for cities. Some of these strategies were also found to be present in some of the cities investigated in this study. Activists and government officials working on sustainability have begun to take into account the central tenets of resilience theory—main drivers, thresholds, feedback mechanisms, and slow and fast variables. These core principles are discussed throughout this dissertation, in particular as part of the adaptive learning framework presented in Figure 3.1. As more cities move to adopt a resilience view, sustainability indicators can be expected to provide a valuable means to measure and track resilience. In the literature on resilience briefly outlined above, I did not find examples to date of operationalizing resilience thinking using sustainability indicators.

2.4.11 Administrative theory and adaptive governance

A key element of resilience theory is the role of adaptive governance in responding to social-ecological system dynamics (*see, e.g.*, Folke, 2006; Brunner et al., 2005; Scholz & Stiftel, 2005). As explained by Hatfield-Dodds et al. (2007), "governance" refers to the institutional arrangements that shape actors' decisions and behavior, including the exercise of authority within groups or organizations (such as firms or nations), while "management" refers to the processes of decision making, coordination, and resource deployment that occur within a given institutional setting, assuming no change in rules and norms.

Early contributions to the literature on adaptive management (Holling, 1973) argued the case against centralized expert management (Ludwig et al., 1993; Levin, 1993, cited in Hatfield-Dodds et al., 2007). Later writings emphasized case studies as a means of exploring the implementation and progressive development of adaptive management arrangements for specific geographic areas or natural resources. Researchers report that implementation of adaptive management is often difficult (e.g., Brunner et al., 2005).

Learning and doing, two key concepts from theories on social-ecological resilience and adaptive governance (*see* Walker et al., 2004; Kofinas, 2009) apply to the present study on community sustainability indicators. As mentioned above, feedback plays a critical role in adaptive learning, which is integral to the idea of adaptive

management (Kofinas, 2009) at the organizational level as well as at the individual and group levels (Sessa & London, 2006). Ideally, in the context of an established sustainability indicator program, SIs provide feedback by communicating measured aspects of local sustainability and, through that process, improve the capacity of the community to anticipate, shape, and navigate change. In this way, SIs may provide essential feedback for organizational and social learning (Sessa & London, 2006) and provide an important means of measuring and reporting change in order to identify trends and assess if implemented policies are meeting a community's sustainability goals.

2.4.12 Bounded rationality and specialization

Two key bodies of administrative theory are applicable to sustainability indicator programs and address the establishment and management of those programs: the problems of bounded rationality and specialization. Bounded rationality refers to limitations inherent in a decision maker's ability to know how future conditions will affect or be affected by a decision (Simonson, 1994). Sustainability indicators could potentially provide information to extrapolate characteristics of large and complex systems that are beyond the limited bounds of conventional rational assessments. The notion of specialization, prevalent in early administrative theory (Simon, 1997), runs counter to today's tenets of sustainability theory, which center on holistic and integrative thinking (Chapin et al., 2009).

Simon (1997) and Cyert and March (1992) provide important insights into the ways organizations, such as local governments, make decisions. Considered in light of Simon and Cyert and March's contributions to administrative theory, sustainability indicators and questions surrounding their implementation may be brought into sharper focus. As Simon (1997) wrote, classical administrative theory considered the following three principles to be underpinnings of administrative efficiency:

- specializing the organization according to purpose, process, clientele, or place;
- arranging the organization in a determinate hierarchy of authority; and
- limiting the span of control of any given point in the hierarchy to a small number.

Simon suggested analyzing organizations by exploring the following three aspects of decision making:

- decision making as an underlying condition for analysis;
- external mechanisms (expectations – stimuli that seeks to influence the individual); and internal mechanisms (stimuli and attention directors). (Simon, 1997)

Simon argued that an organization's decisions do not generally result from the formal actions of the board of directors or any officer or group but, rather, evolve out of interactions among numerous prior decisions made by individuals, committees, and boards through a "composite" process. Comprehending this composite process is important from the standpoint of the individuals who make decisions in that such an understanding can lead to better identification of both the methods an organization uses to influence decisional premises and the extent of decision maker discretion enjoyed within the context of those methods and premises (Simon, 1997).

Mechanisms that influence organizational decision-making processes are fairly well understood. These include division of labor, establishment of standard operating procedures, downward transmission of decisions, provision of channels of communication, and training and indoctrination (Simon, 1997). Within the complex processes of decision making, these organizational theorists uncovered different modes of influence affecting decision makers. Knowing how organizations and their decision makers relate to these deeper modes may help determine whether organizational changes will result in negative or positive outcomes and, in particular, whether they will result in an organization moving toward or away from sustainable practices.

Theories of rational choice, as defined narrowly by March (1994) and Simon (1997), are linked to processes of choice or procedural rationalities. Pure theories of rational choice provide a starting point from which theorists who acknowledge the role of future uncertainty depart. Herbert Simon points out that humans are limited in their capacity to handle many alternatives and choices—a limitation he terms "bounded rationality" (1997). In his work, Simon brought greater realism to neoclassical economic

models he found to be lacking because of their idealized vision of the "rational" consumer, businessperson, or worker. Instead of maximizing their welfare, profits, or wages in the marketplace, Simon believed that a lack of information about alternatives and the impossibility of foreseeing the future make all of these participants "satisfiers" whose rational behavior is "bounded" by the cost of obtaining information and by intrinsic uncertainty. Hence, Simon proposed the concept of "bounded rationality," under which economic agents try to do as well as possible, given surrounding constraints, but certain constraints keep them from ever achieving what neo-classical economists would call a "maximum" (of profits, for example) (Simon, 1997). Bounded rationality describes the human inability to weigh all possible decision-making alternatives when considering organizational changes. Findings in this study support Simon's view that, because bounded rationality can inhibit organizational decision-making processes, decision makers need to locate and understand the limits within which they are working.

Typically, heads of departments in local government find themselves guided by "rational limitations" of budgets, internal and external means of communication and coordination, legislative oversight, and top-level management. Organizations typically deconstruct issues, assigning various matters to specialized subunits and programs within their organizational structure (Shafritz & Ott, 1982). A subject such as sustainability, however, does not easily break down into materials-based subunits. Simon suggests that only by understanding bureaucratic decision-making processes, including this habit of specialization, will sustainability be able to efficiently integrate itself into those processes (1997).

Cyert and March (1992) observed that organizations tend to seek to avoid uncertainty by following regular procedures and, instead of forecasting the future, react to feedback as it is received. This tendency not only inhibits organizational change but conflicts directly with achieving sustainability and resilience which require acknowledging change and surprise and, as a result, favoring integrated long-term planning processes and scenarios analysis. Models for forecasting future conditions potentially provide useful information for planning.

Organizations need to plan as far into the future as possible, setting long-term horizons. Static avoidance and command-and-control approaches to social-ecological systems are unable to manage change and deal with the uncertain or the unexpected (Shafritz & Ott, 1982). I do not argue against planning as Cyert and March's theory suggests. However, because of today's increasingly fast-changing complex social and ecological systems, I do suggest that given that uncertainty is unavoidable, sustainability approaches and adaptive learning frameworks designed up front are most conducive to strong sustainability decision making at the local level.

2.5 Summary

Concepts of sustainability, resilience, adaptive governance, and administrative theory ground the study of sustainability indicators and sustainability indicator programs in local decision making. The literature review reveals that local sustainability indicators are being used increasingly in the United States. Still, most of the reviewed writings address the problem at the theoretical level, with few guidelines available for how to develop and implement sustainability indicators in a practical manner within the context of a robust sustainability indicator program.

This study integrates the theories and concepts found in the literature concerning the development of sustainability indicators and resilience, adaptive governance, and administrative theories, providing a starting point from which to explore my assumption that community sustainability indicators can be used to improve sustainability decision making.

Chapter 3: Sustainability Indicators and Adaptive Learning

3.1 Purpose

This study was framed conceptually by a heuristic Input-Process-Output (IPO) model. This chapter presents the heuristic flow diagram as a framework to illustrate the relationships among sustainability concepts and actions as they manifest in a sustainability indicator project or program. The heuristic shows the information flow of community adaptive learning in the governance context, which occurs within one or more groups under certain conditions and occurs within and across a number of geographic and organizational scales (Kofinas, 2009). The components of the heuristic flow diagram in Figure 3.1 and the relationships among its components are explained in detail in this chapter.

3.2 Framework

I constructed an adaptive learning framework with sustainability, resilience, and administrative concepts as organizing components, including sustainability indicators and domains. After introducing the adaptive learning framework, this chapter will explore each of the seven components of the framework shown in Figure 3.1 and examine the ways in which the components might ideally interact to advance community sustainability through an array of dynamic processes.

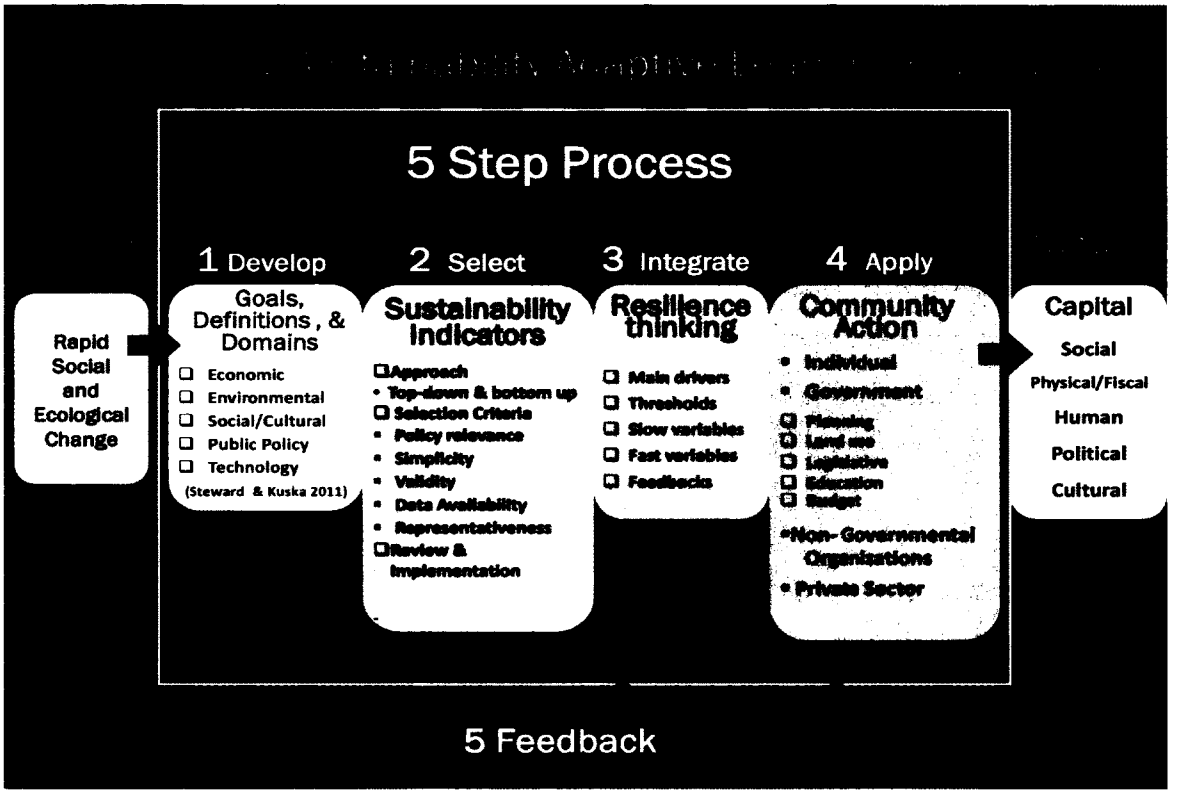

Figure 3.1. Community Sustainability Adaptive Learning Framework. A framework for community sustainability adaptive learning is presented using an input-process-output (IPO) model with seven components: input (social-ecological system); process (goals, definitions, and domains); sustainability indicators; resilience thinking; community action; output (capital); and feedback. The arrows labeled 1, 2, 3, and 4 and pointing to the right represent the flow of information and decision making. Step 5 shows feedback loops pointing back to learning, monitoring, and reevaluating key assumptions, key relationships, policies, rules and governance.

3.2.1 IPO Model Overview

The heuristic IPO model (Figure 3.1) organizes and communicates social-ecological learning processes. The framework is organized around five domains: economic, environmental, social/cultural, technological, and public policy (Steward & Kuska, 2011). The resilience thinking component illustrates the capacity for sustainability indicators to be used for determining main drivers, fast and slow moving variables, and thresholds. Varying levels of community activity will occur within this flow, depending on local values, structures, and formal and informal social processes. At the same time, community action occupies its own space in the model, where it comprises citizen and government groups and their activities. The products of the process components (including incorporation of learning from feedback loops) shape the final component

(output), resulting in varieties of capital that will support community resilience. Feedback loops represent opportunities for learning and monitoring and for re-evaluating the program, promoting adaptation as a result of reflection.

Most social-ecological systems represent open realms where material, organisms, and information flow in, pass through, and flow out (Chapin et al., 2009). Because processes that occur outside of the system tend to influence inputs into the system, these too need to be considered. Global climate change and energy sources such as liquid fossil fuels may represent ecological inputs to the social-ecological system; factors such as poverty or family home heating costs may represent inputs on the social side of the equation.

3.2.2 Development of goals, definitions, and domains

As discussed in chapter two, arriving at consensus on how to define "sustainability" and a community's sustainability goals is important in establishing a successful local sustainability program. Typically, after a local definition for sustainability has been developed, three domains are used to categorize sustainability: economic, environmental, and social/ethical. Although socio-ethical processes are assumed to include technology and public policy, they are not usually specifically called out as equal parts of the basic multiple-domain sustainability framework (Steward & Kuska, 2011). Steward and Kuska (2011) suggest that when implementing sustainability at the community level, technology and public policy need to be elevated to the domain level because these two areas are as important as economic, environmental, and social/ethical domains when it comes to amplifying and stabilizing feedback effects for purposes of enhancing sustainability efforts. As Chapin et al. (2009) point out, any system and its components are more vulnerable to unexpected change when each subsystem is managed in isolation. This study therefore focuses on the following five domains:

- Environmental (natural and man-built infrastructure)
- Socio-cultural (history, conditions, and contexts),
- Technological (appropriate, sustainable)

- Economic (the production of goods and services within a sustainable context, and financial resources to support protection, trade, operations, and maintenance)
- Public policy (government, or public rules/regulations)

The five-domain sustainability framework can also be used on different scales, ranging from a single residential building to a region (Steward & Kuska, 2008).

Whether you organize indicators of sustainability into three or five domains, all domains need to be integrated and considered holistically for decision making. The value of the sustainability framework is that it provides a dashboard (list of major indicators or variables) of components in the social-ecological system that must be viewed together in order to be considered in an integrated fashion (Scipioni et al., 2009).

3.2.3 Selection of indicators

Eckerberg and Mineur (2003) found that a top-down and bottom-up approach is the best method for selecting indicators. The combined approach of experts and decision-makers (top-down) and the public at large (bottom-up) ensures that the technical and scientific information as well as the community normative features are considered. Although not the main focus of this study, indicator selection represents a significant step in developing and implementing sustainability indicators. Figure 3.1 shows five of 15 criteria for selecting sustainability indicators (Warner, 2006). These criteria establish a guide for formulating and choosing effective indicators in order to keep the indicator set manageable and useable by a diverse array of stakeholders, ranging from broad policy makers to specialized public interest user groups.

Sustainability indicators, grouped under domains, can be used to enhance social-ecological systems in several respects, including measuring and monitoring components of the social-ecological system and providing feedback. Local sustainability indicators have normative and objective components (Hak et al., 2007). These are shaped on a community's values and beliefs and political, philosophical, and cultural characteristics. In the cities investigated in this study, after the indicators were selected, they were usually presented to and reviewed by the city manager and/or elected officials. Of the small percentage of cities that decided to develop sustainability indicator lists, most

reached this step, but most did not advance beyond developing lists to using them or institutionalizing them.

Determining what are the conditions for moving sustainability indicator lists to implementation and identifying the barriers to moving the sustainability lists to implementation was a central objective of this study. In the few cities that have successfully developed sustainability indicators and that are implementing them, the indicators fit into some kind of reporting mechanism, such a published report submitted to the public and decision makers or incorporated into a comprehensive plan, or the indicators are periodically reviewed internally by city government employees. Feedback loops, described below in steps three and five of the IPO model, provide information to consider for re-evaluating previously selected sustainability indicators.

3.2.4 Integration of resilience thinking into community SIs

Turning to the next component in the IPO model, sustainability indicators are used to integrate concepts from resilience theory such as main drivers, slow and fast variables, feedback, and thresholds (Gunderson & Holling, 2002). Sustainability indicators as feedbacks identify key "slow" variables in terms of what has changed, is changing, or is likely to change (Resilience Alliance, 2007). The Resilience Alliance's *Assessing Resilience in Social-Ecological Systems: A Workbook for Scientists* (2007) suggests a series of questions that could be used for understanding changes in the system: Are feedbacks in the system weakening or getting delayed? What are the current directions and rates of change of important slow variables? What could alter this? Which variables influence the rate of change? Is the system becoming more interconnected? How does this aspect relate to identified processes and related feedbacks?

The adaptive cycle may be used to understand better the relationship between indicators and the resilience of the system; it provides a conceptual framework to facilitate understanding of the ways in which relationships, interactions, and a system's physical, ecological, and social processes change through time (Gunderson & Holling, 2002). A specific example of how the adaptive cycle can be used to understand an issue can be found in chapter eight, which recounts a short-term electricity "crisis" in Juneau,

Alaska, that caused an increase in electrical prices of 500 percent for a 45-day period, forcing community-wide adaptive measures (Leighty & Meier, 2011).

To ensure that adaptive management strategies occur, a commitment at the beginning of the project from the policy group is included in the model. After these analyses are completed, the report may need revisions, intentional experimentation, and other learning activity that may require funding.

Indicators help to identify, measure, and better understand the status of different types of community capital. The following four resilience principles have an important role to play when crafting and working with sustainability indicators:

1. learning to live with change and uncertainty;
2. nurturing diversity of reorganization and renewal;
3. combining different kinds of knowledge; and
4. creating opportunities for self-organization (Berkes & Seixas, 2005).

Incorporating these resilience factors, creating political space for experimentation, combining local and scientific knowledge, matching scales of ecosystem and governance, and creating multi-scale governance all represent measures that, up to the time of this study, have rarely been utilized by communities in their SIPs. An important purpose of the IPO model is to improve our resilience (including adaptive capacity) locally, by including these factors when developing, operationalizing, and reporting on SIs.

3.2.5 Community action

The community action component in the adaptive learning framework identifies government programs, community organizations, and individuals, all of which have essential roles to play in implementing sustainability indicators. As previously mentioned, one or all of these entities may have been involved in the prior development of the goals and indicators through a bottom-up process. Stakeholders, including the general public, community residents, decision makers, and community leaders, are critical to how well this component will work. These people can become aware and learn, understand, and take action to move a community closer to or away from sustainability.

Government actions may include informal processes, such as networking and other exercises of social capital, and the making of formal rules and laws that support sustainability actions. Nongovernmental organizations, businesses, and universities are all stakeholders in sustainability. Although sustainability should be established in the formal processes of local government, such as budgeting, procurement, and planning, informal processes and individual actions such as recycling and energy conservation are ultimately as important to achieving sustainability. The products and work accomplished in the previous components (sustainable framework, indicators, and integrated analysis) would be used by the actors in this component.

3.2.6 Output

The last component in the model is the Output stage of adaptive learning. One way of increasing community resilience is by building the community's five types of capital: human, political, natural, physical/fiscal, and social (Chapin et al., 2009). While sustainability indicators may be used to determine the status of issues and aspects of sustainability, community capital indicators may be used as a dashboard to monitor and measure the strength and resilience of the community. The simplest approach is to seek to sustain the inclusive wealth of the system – total capital (natural, physical, and social). According to Chapin et al. (2009), natural and social capital, as the most difficult forms of capital to renew, are the most critical components of inclusive wealth to sustain.

3.2.7 Learning through feedback loops

Reflection and adaptive learning, as has been discussed by Gunderson (1999) and Lee (1993), are necessary if a city and policy makers are to embrace uncertainty as a central tenet of adaptive governance. The feedback loops presented in the heuristic IPO model in this chapter illustrate junctures at which learning might occur amid the components of a community adaptive learning paradigm. Kofinas (2009), building on the organizational learning work of Argyris and Schön (1978), has developed a single and double loop learning diagram in which single loop learning involves changing actions to meet identified management goals; double-loop learning is a process of evaluating underlying assumptions and models. (*See* Figure 3.2.) Folke et al. (2009) describe the

triple-loop learning model in Figure 3.2 as related to transformation—the fundamental alteration of the decision making system once the current ecological, social, or economic conditions are assessed to be untenable (Walker et al., 2004; Nelson et al., 2007).

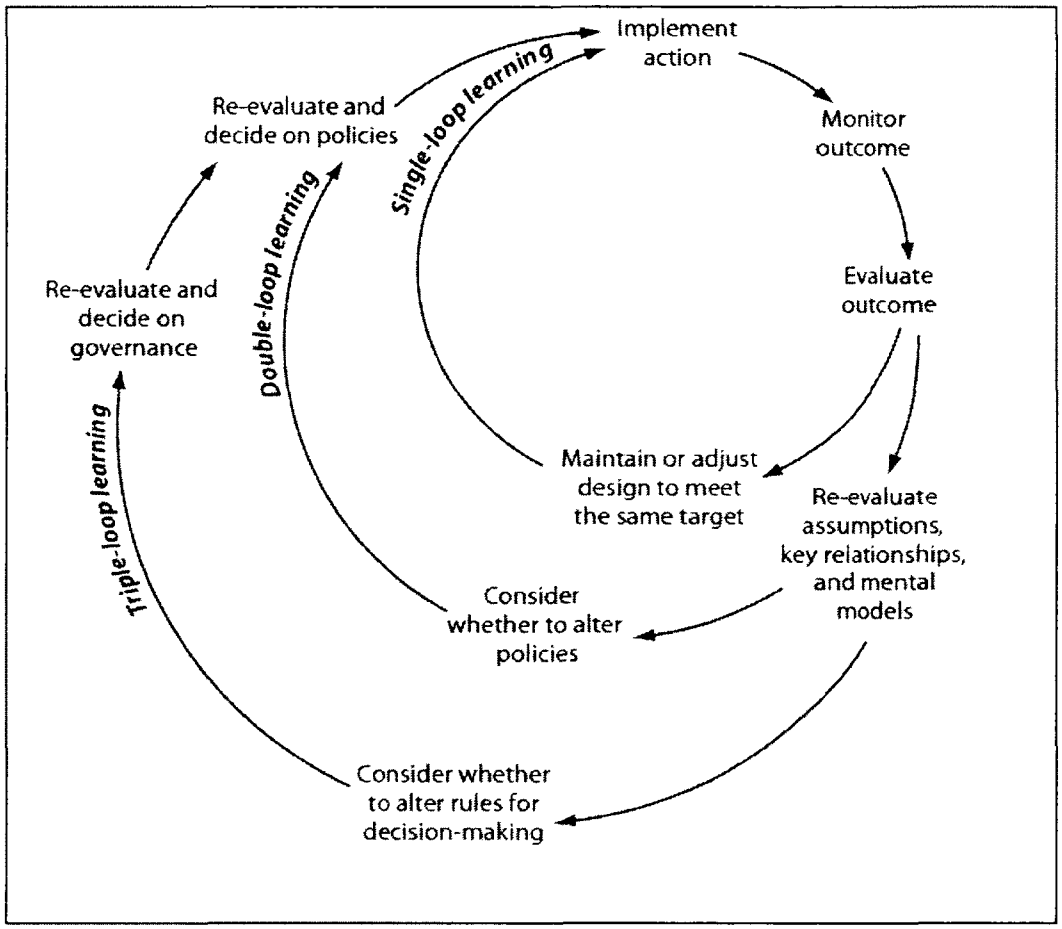

Figure 3.2. Triple-Loop Learning Diagram (from Folke et al., 2009, p. 105). The diagram shows triple-loop learning, including single-loop (maintaining or adjusting existing programs and practices), double-loop (evaluating alterations to existing policies), and triple-loop (considering fundamental changes in norms and institutions) learning. (Armitage et al., 2007)

Triple-loop learning is embedded in the Community Adaptive Learning Framework IPO Model in Figure 3.1 under "Feedback," in the arrows that point back to the process's components. While learning can occur at any point in the model, the feedback arrows point to components in the framework continually nourished by changes in the "output" or capitals. Questions are addressed by examining what feedbacks occur

between the five sustainability domains—economic, environmental, public policy, technology, and social/cultural. Benchmarks or goals for different sustainability indicators as well as thresholds could be created and re-evaluated to determine where the thresholds are and what determines their positions on the controlling variables (Resilience, 2007). Learning occurs for individuals, city government, and the community through the feedback mechanism in the IPO model. Community learning will be discussed in more detail in the context of the Juneau case study presented in chapter seven.

3.3 Summary

The community adaptive learning IPO model, which served as a framework for this dissertation, provides a structure for considering resilience on a community scale. Each component in the model is important and plays a role in building awareness, identifying critical parts, increasing understanding of the social-ecological processes, and providing information to decision makers and stakeholders.

The components and feedback loops offer an approach for distilling complex systems in a way that allows for social and individual learning among community stakeholders. Although scientific knowledge may currently be inadequate to understand many aspects of human-environmental interactions, and some feedback loops between human and environmental systems remain irreducibly complex, as illustrated by this framework, many issues are nevertheless sufficiently understood to facilitate the formulation of scientifically accurate indicators (Hak et al., 2007).

Chapter 4: Patterns of Sustainability Indicators Use and Sustainable Planning in U.S. Cities

If we don't get the data, the decision will just be based on politics.

- A local elected official in California on the subject of whether the county should enact controls on growth. (Innes, 1990)

4.1 Introduction

Over the past two decades, a growth spurt in city sustainability activity around issues such as climate change mitigation and adaptation, energy efficiency, waste reduction, and alternative energy production has occurred in the United States. In some cases, sustainability indicators (SIs) have been used to measure and monitor these issues (*see* Kahn, 2006).

The objective of the data collected in this phase of the study was to determine how frequently and in what manner cities in the United States are instituting sustainability programs and, among those that have such programs, which are utilizing sustainability indicators and to what degree.

This chapter begins with an overview of the methodology used by the Natural Resource Defense Council (NRDC) to formulate its 2009 listing of "Smarter Cities," which provided base-level data for the dissertation, and goes on to report on this study's investigation of 200 American cities to determine how frequently and in what ways cities in the U.S. are working with sustainability and, in particular, sustainability indicators. The Internet served as the primary source for information on the 200-city proportional stratified random sample taken from the 645 cities (N = 645) ranked by the NRDC.

A five-tier categorical system was developed for organizing the information, trends, and patterns that emerged in the research. The chapter also includes a comparison of NRDC's "Smarter Cities" list to this study's review of the 200 cities selected from that list to determine where the cities using sustainability indicators stood on the NRDC ranking. The major patterns of SI use, geographic differences, sustainability innovations, and environmental initiatives are summarized, as is the tendency of cities to "silo" sustainability indicators, particularly within the social domain.

4.2 Methods

The study began with a broad investigation of 200 U.S. cities selected from a list of 645 cities (N = 645) with populations of 50,000 or greater that had been ranked for sustainability by NRDC's Smarter Cities Project. In 2005, the Smarter Cities Project of the Natural Resource Defense Council (NRDC), a nongovernmental organization, began ranking cities in the United States for environmental sustainability and livability (Natural Resources Defense Council, 2009). In addition to data gathered from its survey efforts and other investigation, the NRDC employed several resources to produce its "smarter cities" ranking, including United States Environmental Protection Agency (EPA) and United States Census Bureau ("census") data sets.

In the last published report issued in 2009, the Smarter Cities Project ranked 645 cities with populations of over 50,000. Recognizing that different-sized cities face different issues and possess different resources to deal with those issues, NRDC organized its rankings into three groups by population, shown in Table 4.1 (Natural Resources Defense Council, 2009).

Table 4.1 NRDC's 2008 Smarter Cities Population-Based Ranking

Size	Population Range	Number of cities
Small	50,000 – 99,999	402
Medium	100,000 – 249,999	176
Large	250,000 and greater	67
	Total	645

NRDC based its findings on both qualitative and quantitative data. Its study began with interviews of mayoral staff or environmental officers. Of the initial 645 cities surveyed, 160 (24.3%) responded (Natural Resources Defense Council, 2009). Cities not responding to the survey were assessed using available quantitative data from government and nonprofit databases. Each of the cities was scored on one of three lists corresponding to population size.

The same nine broad subjective sustainability criteria were applied to each of the cities in the three population categories. NRDC assigned points for the presence of specific sustainability factors, with additional points added for innovation, for a maximum attainable 100 points (*see* Appendix 2).

Since 2008, NRDC has discontinued the city ranking procedure that laid the foundation for this dissertation. According to Paul McRandle, the organization found that "[d]efining the city was difficult and the desire to dig into each issue on balance won out" (personal communication, January 26, 2011). In other words, NRDC now prefers to focus more on separate sustainability issues, like transportation and energy, rather than aggregating issues for overall sustainability.

After selecting and studying sample cities from the NRDC rankings, my study moved ahead with its own chosen methods, including a five-tier ranking system that evaluated the extent to which communities were using SIs and SIPs.

A proportional stratified (by population size) random sample was taken from NRDC's population categories to select 200 cities to be investigated. The sample represented approximately one-third of the cities in each of NRDC's three population groups, as shown in Table 4.1. Percentages of the stratified sample are shown in Table 4.2.

Table 4.2 Proportional Stratified Random Survey Sample

City Size (Stratum)	NRDC List	Proportion of stratified sample	Number of samples in this study
Large	67	0.34	20
Medium	176	0.33	53
Small	402	0.32	127
Total	645 (N= 645)		n=200

Google served as my primary Internet search engine in the initial investigation. To standardize the research, the following 12 key words and phrases were used to query each city: "planning," "long-term planning," "comprehensive plan," "master plan," "name of city," "economic," "indicators," "energy," "sustainability," "environmental," "climate change."

The results showed a set of cities to be engaged in a broad array of environmental activities, such as recycling and energy conservation, some of which are placed under the banner of "sustainability." Other terms, listed below, were also given various definitions, raising questions such as are "quality of life" indicators or "smart growth" initiatives synonymous with "sustainability"? The investigation encountered a variety of terms used

by cities to describe their environmental and sustainability activities. The most frequently mentioned terms included "smart cities," "smart growth," "green community," "green building," "green energy," "sustainable community," "environmental sustainability," "sustainable energy," "sustainability," "sustainability plan," "comprehensive plan," "visioning," "well-being," and "quality of life."

A close investigation of the available materials on each city was required to associate each city's terminology with ongoing activities on the ground. The types of indicators found in my web-based research to be most frequently used by communities to measure sustainability include economic, transportation, energy, and environmental. Some communities that take a holistic approach use terms such as "quality of life," "green," "well-being," and "smart development." The word "sustainability" tended to appear more frequently in relatively recent land-use planning documents, strategic plans, and letters and memos from mayors and other city decision makers. Still, only a small minority of cities (less than 10 percent of the 200 researched) use sustainability in the title of a formal organizational unit.

Most cities had a search engine function that was used in this study to search city documents such as comprehensive plans, master plans, ordinances, and policy statements for information about the city's sustainability activities. Materials from the Smarter Cities project and city websites served as the main sources of information. Additional information was found in university studies on some of the more popularly known sustainability efforts, such as those in Seattle, Washington, and Jacksonville, Florida.

A spreadsheet was used to record information retrieved from Internet searches and other sources for the 200 cities. As patterns emerged from the information collected, the spreadsheet was populated with data organized into nine areas, including the city's ranking on the five-tier scale I established for ranking the overall level of each city's SI development (*see* Table 4.3).

This first phase of the study determined which of the 200 sample cities used sustainability indicators (SIs) in any manner. Cities whose websites revealed no relationship to sustainability indicators or similar quantifiers were recorded in the

"absent" tier (see below). Those whose websites or other sources revealed engagement with SIs or similar indicators (e.g., quality of life indicators where a holistic approach that included social, environmental, and economic indicators was taken) were counted as having SIs.

Those cities showing evidence of engagement with SIs were studied in more depth to reveal the extent to which sustainability indicators had been institutionalized in local government decision making. A city showing an entity such as a Sustainability Coordinator, Office of Sustainability, Commission or Task Force on Sustainability, etc., was recorded under the column heading "Institution." For cities that had instituted innovative means, such as original software or the use of a creative organizational structure, the heading "Innovation" was used. Cities involved in energy conservation, climate change initiatives, recycling, or alternative energy production were listed under the category "Environmental Initiatives." The five-tiered SI categorical system was used to rank each city according to the degree to which it had developed SIs and put in place a sustainability indicator program.

The five tiers—ranging from "absent" (cities without any sustainability indicator activity), to partial, or "disaggregated" programs, to "aggregated" programs, to programs that have "operationalized" SIs, and, finally, those that have gone on to use indicators for monitoring sustainability—revealed patterns and trends in American cities' development of SIs and the relationship between a city's SIs and its NRDC sustainability ranking. The five tiers thus provided the general framework for organizing the study's empirical findings.

Table 4.3 Five Tiers of Community Sustainability Indicator Use. Each of the 200 cities was categorized using this five-tier system based on the level of sustainability indicator (SI) use, ranging from Tier 1 (no SIs) to Tier 5 (full SIP).

Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
	Disaggregated Disaggregated sustainability indicators or goals	**Aggregated** Sustainability indicators aggregated and goals in place	**Operationalized** Sustainability indicators & goals operationalized	**Monitored** Sustainability indicators & goals institutionalized & monitored

4.3 Results

4.3.1 Tier 1 – SIs/SIP absent

This category comprises communities that have no SIs, no sustainability plan, no sustainability program, and no sustainability goals or objectives. It includes the cities in which my research discovered neither use of the word "sustainability" nor other language commonly associated with sustainability. Comprehensive planning is performed by many of these cities, in which traditional indicators, such as economy and human health, are norms. Based on the study's web-based investigation, most small cities—95 out of the 125 small cities studied—fall into this category. Among the sampled small cities, some had disaggregated (9), relatively few (11) had aggregated programs, (10) had operational SIs and none had monitored SIs.

4.3.2 Tier 2 – Sustainability efforts disaggregated

Tier 2 communities have partial or disaggregated sustainability activity. Among the goals of any sustainability effort are that it be overarching, integrative, and holistic (Maclaren, 1996). This category includes communities that have sustainability indicators that include some but not all major elements of a social-ecological system, such as economic, social, and environmental. Some communities mentioned SIs that could be considered to be a partial or "disaggregated" sustainability program that usually included the economic and environmental dimension of sustainability, such as energy consumption, solid waste, recycling, or economic activity. Overall, cities in this category (24) used indicators independently from each other with no evidence of integration.

4.3.3 Tier 3 – SIs aggregated and SIP present

Tier 3 comprises communities that have developed an overall sustainability plan with goals and use indicators to measure the totality of sustainability in the context of an integrative, participatory, and long-term planning system. Communities that fall into this category have aggregated sustainability goals but have not yet operationalized the indicators. The City and Borough of Juneau, the subject of the case study presented in chapter eight, falls into this tier because it has goals and draft indicators that have not been operationalized. The number of cities is (24) or 12% of the total.

4.3.4 Tier 4 – SIs/SIP operationalized

Communities ranked under tier 4 have formulated sustainability plans and indicators and are using them for local decision making. Some local governments and local NGOs have developed sustainability plans with indicators for use by local decision makers. The research found that 7% or 14 cities of the 200 communities reviewed are using sustainability plans and indicators, and even fewer have integrated them into local decision making.

4.3.5 Tier 5 – SIs monitored and SIP operational

The "monitored" category includes communities that have established sustainability plans and indicators that have been operationalized by a local government that uses indicators as part of a monitoring system to make annual adjustments to move sustainability forward. For a city to qualify for this tier, it must have incorporated sustainability indicators into a transparent management system that government officials and residents are using to link sustainability goals to the community's actions. Several of the largest and most highly ranked cities from the NRDC list that have fully implemented sustainability indicator projects made this category. Many of these communities have put in place innovative programs with sophisticated tracking software to track their sustainability progress. This highest, most developed, program category also includes programs that demonstrated a monitoring feature.

Table 4.4 Results of Five-Tier SI Development Ranking of 200 Cities.

Five Tiers of Sustainability Indicator Development (k=1,000)	Large cities 250 k or more	Med. cities 199-249 k	Small cities 50-199 k	Total	
Tier 1 (SIs Absent)	6	33	95	134	(67%)
Tier 2 (Disaggregated)	6	9	9	24	(12%)
Tier 3 (Aggregated)	6	7	11	24	(12%)
Tier 4 (Aggregated, Operational)	0	4	10	14	(07%)
Tier 5 (Aligned, Operational, & Monitored)	3	1	0	4	(02%)
Total	21	54	125	200	

4.3.6 NRDC's Top 10 Smarter Cities compared with survey cities

Table 4.5 shows the relationship between NRDC's top 10 ranked cities and this study's research results by population and SI five-tier ranking (Natural Resources

Defense Council, 2009). Overall, the five tiers developed for this dissertation correspond well to NRDC's top 10 smartest cities, in that each of the three highest-tier cities from the 200 reviewed in this study—Portland, Oregon, Huntsville, Alabama, and Fayetteville, Arkansas—were ranked among NRDC's top 10 smartest cities for sustainability. Table 4.4 shows 28 of the 200 cities in this study ranked in tier four or five. It was beyond the scope of this paper to study the implications of SIPs on sustainability. These findings suggest the need for more analysis of that question.

Table 4.5 NRDC's Top 10 Smarter Cities Compared with This Study's SI Tiers.
NRDC's top 10 cities with population size categories listed with the five-tier ranking. *Portland, OR, Huntsville, AL, and Fayetteville, AR* ranked in the top 10 by the current study (Natural Resources Defense Council, 2009).

NRDC Top Cities	Large City 250,000 +	SI Ranking	Medium city 200k to 249 k	SI Ranking	Small City 50 k to 199k	SI Ranking
1	Seattle, WA		Madison, WI		Bellingham, WA	
2	San Francisco, CA		Santa Rosa, CA		Mountain View, CA	
3	***Portland, OR***	***Tier 5***	Fort Collins, CO		Norwalk, CT	
4	Oakland, CA		Springfield, IL		Sarasota, FL	
5	San José, CA		Eugene, OR		Burnsville, MN	
6	Austin, TX		Spokane, WA		***Fayetteville, AR***	***Tier 4***
7	Sacramento, CA		***Huntsville, AL***	***Tier 5***	Mission Viejo,CA.	
8	Boston, MA		Scottsdale, AZ		Arlington Heights, IL	
9	Denver, CO		Tallahassee, FL		Nashua, NH	
10	Chicago, IL		Laredo, TX		Redmond, WA	

4.3.7 Effects of community size on sustainability ranking

The 200 cities investigated in this study were selected as samples from cities of three population sizes, recognizing that cities of varying populations generally function differently. According to Paul McRandle at NRDC, who oversaw the Smarter Cities Sustainability Ranking, both population size and geographical variables matter when it comes to ranking cities for sustainability. He notes that spatial aspects, including geopolitical boundaries, biophysical boundaries, and issues stemming from international trade, such as rapid growth, widening income gaps, and pollution, all influence the development and composition of sustainability indicators (personal communication, January 26, 2011).

The review of the 200-city sample found that, as shown in Table 4.6, the presence or absence of sustainability indicators correlates significantly (Chi square = 22.4) to a city's population. This finding is not surprising, given that larger cities have the advantage of economies of scale and consequently possess greater capacity for taking on new programs. The research showed medium-sized cities engaging in proportionally more innovative activity. For example, eight out of 41 large cities (19%) use SIs, as compared to 11 out of 166 small cities (6%). The research also found that 10 out of the 41 large cities studied (24%) have institutionalized sustainability in some way; in contrast, sustainability measures (not always including sustainability indicators) have been institutionalized in only 20 of the 166 small cities. As shown in Table 4.6, these findings bear strong statistical significance (P value = 0.00043).

Table 4.6 City Size and Variable Expectations. The chi square (22.4) calculation shows a strong significance (P=0.00043) between large cities and cities with SIs.

Variables	**Large cities**		**Medium cities**		**Small cities**		**Total**
	Expected	Observed	Expected	Observed	Expected	Observed	
SIs Present	3.35	8	7.10	5	13.55	11	24
Institution	6.69	10	14.20	18	27.10	20	48
Innovation	3.90	3	8.29	14	15.81	11	28
Environ. Initiatives	27.05	20	57.41	50	109.54	124	194
Total		41		87		166	294

4.3.8 Prevalence of environmental initiatives

Almost all of the 200 cities examined indicated on their websites some level of engagement in environmental and conservation activities. Beyond the government's website, evidence of environmental projects or activities was sometimes found in separate government documents or on other nongovernmental websites that discussed a city's activities. This category was designed to distinguish cities simply undertaking some environmental or conservation activities from those with sustainability goals or sustainability indicator programs. A city may be conducting environmental and conservation activities, e.g., climate change mitigation and adaptation, energy conservation, green building initiatives, or waste reduction and recycling, in the absence of sustainability goals, indicators, or a program. There is evidence that smaller cities

oftentimes lack the capacity to establish a new program such as a sustainability indicator program or to take on even small programs that can achieve high enough visibility to gain substantial public support.

4.3.9 Government sustainability offices

A few local governments (11 or 5.5%) have adjusted their organizational structures to add an office or program of sustainability (*see* Table 4.7).

Table 4.7 Sustainability Program and Institutional Change. The frequency of cities reporting sustainability programs and institutional change are listed in four categories. Only 5.5 percent of the 200 cities surveyed have established projects or programs. A lower percentage of cities have sustainability coordinators, a committee or taskforce, or have established a partnership with a nongovernmental organization (NGO).

Sustainability Program and Institutional Change	Percent and Number of cities n =200
1) Projects or Programs	5.5 (11)
2) Sustainability Coordinators	3.5 (7)
3) Committee or Taskforce	3.0 (7)
4) Partnerships with NGOs	2.5 (5)

Governments reporting programs or projects may or may not have developed and implemented sustainability indicators, and there is not enough evidence from this study to determine if the projects or programs are applying sustainability across the entire government or if efforts remain based in a single program.

The City of Albuquerque, New Mexico, which has established a sustainability office in the Mayor's Office, provides an example of a city that has made an institutional change to support its sustainability efforts (City of Albuquerque, 2011). Sometimes the title of an existing department has been changed to reflect the city's involvement in sustainability work. For example, the City of Portland's former Bureau of Planning is now the Bureau of Planning and Sustainability, with the bureau's objectives having been expanded to include "promoting integrated land use planning" (City of Portland SEA Report, 2010). In some cases, a temporary body, such as a task force or commission, has been established to develop sustainability indicators and address sustainability issues, in general.

Since 2008, several cities have taken advantage of United States Department of Energy stimulus funding to create a new position frequently referred to as Sustainability Coordinator (U.S. Department of Energy, 2008). This position is normally stationed in a city's planning, public works, or environmental services department, although some cities have set up the new position in a new office that reports directly to the Mayor.

A thorough review of city organizational structures and reports and other relevant documents available on the Internet revealed that, while some city department organizational structures have changed to support sustainability efforts, most have not. Less than 20 percent of the cities reviewed use the word "sustainability" or words that characterize sustainability, like "integrated planning," on their websites or in their comprehensive plans. On the other hand, a few cities, such as Fayetteville, Arkansas, have established a separate office of sustainability, which coordinates and promotes principles and programs for sustainability. The programs of three of the cities found in this study to be engaged in the highest levels of sustainability work—Fayetteville, Portland, and Albuquerque—are discussed in depth in the next chapter.

4.3.10 Tier rankings by region

Is there a relationship between geographic regions and city SI tiers? Several geographic approaches have been developed by various governmental agencies and private sector organizations that divide the United States into regions. The United States Census Bureau separates the country into four regions: West, South, Midwest, and Northeast (U.S. Census Bureau, 2009). Frequency distribution of cities with sustainability indicators is organized by SI tier into these four regions in Table 4.8.

Table 4.8 Regional Distribution of SI Tiers. Average tier ranking of 200 studied cities by the U.S. Census Bureau's four regions.

US Regions	West	South	Northeast	Midwest
Number of cities	62	67	33	38
Average SI Tier	2.07	1.52	1.33	2.49
Cities with SIs (Tier 2-5)	30	19	6	11

The Midwest region earned the highest average five-tier ranking (2.49) and the Northeast, the lowest (1.33). Appendix 4 contains a listing by region of all 200 cities reviewed in the first part of the study. Overall, the West and Midwest regions contain the greatest number of highest-tier sustainability performers.

4.3.11 Integration of social and ecological domains

A central tenet of sustainability involves the integration of social-ecological system domains or, in this case, the community's social, ecological, and economic, technology, and policy sectors. Only 12 communities out of the 200 investigated in the initial phase of the study have stated as a goal the integration of social and ecological domains (*see* Appendix 4). Specifically revealing is the lack of communities that have integrated social indicators and ecological and economic domains as part of their sustainability framework. Cities' non-integration, or "silo-ing," of the social domain (programs) revealed in the research on local governments aligns with other anecdotal evidence uncovered in the study. Results from one of the largest social surveys, the Gallup-Healthways "Well-being Index," which reports on the social and human health of communities, have not been integrated into city sustainability. The Index represents one of the most extensive initiatives of its kind, with 1,000 Americans polled every day on their attitudes about social well-being (K. Bell, personal communication, June 17, 2010).

There was a general lack of discussion of social-ecological systems in the sustainability research and in the information available on specific cities. The ecological side of the social-ecological equation is much more developed in both of these research realms (Folke, 2006). The literature is just recently beginning to recognize and address social resilience in its full complexity.

4.3.12 Innovations

The study's review of city government websites found several innovative programs and approaches being pursued to advance sustainability. Organizational structures using the word sustainability, web pages with sustainability indicators or benchmarks, and sustainability-related projects or programs were all reviewed to find any innovative programs that have been developed for implementing sustainability indicators.

These innovations, including such tools as matrices, web-based software enhancements, including graphics, sustainability plans, and dashboards are highlighted below. The dearth of models or established programs is likely driving innovation.

4.3.13 Transparency: web-based monitoring and reporting

Some high-performing cities, such as Albuquerque and Portland, have implemented easy-to-use, highly visible website graphics to display sustainability goals, measures, and other resources in efforts to heighten public awareness and solicit public comment. These websites increase the transparency of cities' sustainability programs and nurture buy-in. Albuquerque's dashboards show the different program elements and measurements together in one place, making for a more holistic picture that contributes to the use of more comprehensive methods and measures. Dashboards and other high-tech graphic representations of data, actions, and measures were not available to early SIPs but are becoming a common feature of today's programs. Although not a city included in the 200-city survey, Oakland, California, as part of its 2006 Sustainable Development Initiative, formulated and published on its website a baseline matrix that included the typical sustainability areas of environment, energy, and transportation, accompanied by action items, measures, and departmental responsibilities—as well as a leadership opportunities category. The matrix format allowed site visitors to see the different departments' responsibilities, goals, and measures in one place next to each other. This represents perhaps the first formal effort by a city to integrate its sustainability agenda through a matrix format. However, as a result of the 2006 Urban Environmental Accords resolution, Oakland may be shifting to a different tracking and reporting format. The 2006 Accords established 21 areas of emphasis for "building an ecologically sustainable, environmentally dynamic, and socially equitable future," centering on the areas of energy conservation, environmental protection and preservation, and a few environmental health areas.

4.3.14 Sustainability plans

For most cities, long-term planning traditionally has involved the preparation of periodic comprehensive plans that produce written blueprints for city officials to follow.

Comprehensive planning has been used since the early 1900s, since the appearance of "The Chicago Plan" (Costonis, 1972). Most of the cities surveyed in the present study engage in comprehensive planning—usually under laws or regulations requiring them to do so. The standard comprehensive plan will generally map out a vision and direction for land use, utilities, environmental preservation or restoration, transportation, housing, and other aspects of the built environment (Innes, 1996).

Based on the cities surveyed in this study, during the past five years, an increasing number of U.S. cities have begun to add a new section on sustainability to their comprehensive plans or have changed the plan's title to "Sustainability Plan." A few communities that have switched from comprehensive planning to sustainability planning, including Albuquerque, New Mexico, and Portland, Oregon, appear to be explicitly seeking a more holistic planning approach. By taking a resilience approach, these cities identify main drivers and slow and fast variables; through this new holistic lens, additional sustainability and resilience indicators can be expected to emerge. In some cases, (e.g., Portland OR, and Jacksonville, FL), this study found that among the cities with the most developed sustainability programs, discussed in chapter six, feedback is already changing policy decisions.

Sustainability plans differ from comprehensive plans in that they associate planning objectives with sustainability, generally using measures or indicators. Because sustainability goals tend to be broad and overarching, applying measures and indicators can help a community to operationalize sustainability, both by providing markers to assess progress toward goals and by using indicators to frame communications among city officials and between a government and the public.

Changing a planning document's title from "comprehensive plan" to "sustainability plan" may in some cases be largely symbolic, but some of the renamed plans were found to have real teeth. For example, as reported by the City Planner from Fayetteville, Arkansas, that city's sustainability plan included a full program, with sustainability goals, objectives, measureable indicators, and a reporting mechanism.

Traditionally, comprehensive plans establish a 5 to 10-year planning period. Sustainability plans tend to look out over a more distant planning horizon and encompass a broader range of issues, such as energy conservation, green building, transportation, and social or cultural programs. These plans also often include aspects of resilience thinking—for example, taking into account foreseeable and unforeseeable change and seeking solutions through experimentation.

As discussed in chapter two, the capacity of people to plan within a context of uncertainty and change represents a fundamental departure from traditional command-and-control governance that moves from reference point to reference point (Chapin et al., 2009). The longstanding habit of managing based on steady predictors is quickly becoming obsolete under today's rapidly changing conditions, including the swift directional changes in the natural environment, e.g., the effects of warming climate on Alaska or the rapid urbanization taking place in the most populated countries of the world.

4.3.15 Dashboards

Three of the four cities that have fully operationalized SIs (Tier 5) use dashboards. The dashboards are shown on the city's website or referenced elsewhere. Only a few cities that have SIs in other Tiers (2 – 4) use dashboards. A feature of sustainability plans that has begun to appear more frequently involves the use of a city-wide "dashboard" as a tool for integrated reporting. The dashboard typically presents key sustainability indicators from different sectors of a community, summarized in one short, easy to read, nontechnical report. A dashboard approach is highly suitable for website use, too, allowing for succinct and prompt reporting of periodic indicator updates. Because they are dynamic, dashboards may contribute to a system's resilience by facilitating better monitoring of fast-moving variables. For example, Fayetteville, Arkansas, has an interactive "Eco-Dashboard" website that includes graphics for electricity, gas, water, and fuel consumption and waste production. Trends in each of these categories are tracked in graphic and tabular formats not only to monitor the city's

internal progress, but to compare the city's progress to other cities' performance (University of Arkansas, 2012).

4.4 Summary of Findings

The following list summarizes the major findings of the study's web-based investigation of 200 U.S. cities:

- A large majority of the cities investigated did not have SIs (67%).
- A significant relationship was found to exist between SI Tiers and city size.
- Few (5.5%) of the cities have adjusted their organizational structures to add an office or program of sustainability.
- SIs and SIPs were found more frequently in cities in the Western and Midwest regions of the United States.
- Dashboards are being used by four cities with highly operationalized SIs.
- A small percentage (6.6%) of the cities had a stated goal of integrating social and ecological domains.

4.5 Discussion

Some communities have begun to invest in their productive base and inclusive wealth pursuant to sustainability indicator-based measures by, for example, increasing the number of green buildings, the degree of energy conservation, new alternative fuel production, etc. Learning about the relationships between economic and social programs and then developing measurements reflective of those relationships represents a resilient and adaptive learning process.

One of the most difficult things to accept if you are a local decision maker is that all policies are by their nature experimental (Lee, 1993); acknowledgement of this reality will lead a community to strengthen its adaptive capacity. Even though policies tend to always be in a state of flux, because government at the local level is expected to work, risks are rarely taken. While state and federal decision makers may enjoy a degree of distance from their constituents, local officials make decisions—whether those concern sewer lines or school budgets—that personally affect people they run into on the street

every day. Elected and other local government officials can thus hardly be blamed for wanting to play it safe. The problem for the volunteer activist working on a city's sustainability plan is that "safe" often means "short-term."

Another important aspect of learning stems from past experiences, which create "path dependence." Path dependence, by which current dynamics become linked to past events, lays a foundation for the future (Pierson, 2000). An example can be seen in the ways the Great Depression of the early-20th century continued to influence economic decisions made in households 40 years later (Chapin et al., 2009). As George Santayana famously said, "Those who do not study the past are doomed to repeat it." Resilience theory sees evaluation and reflection as part of an expansive (rather than limiting) learning process that can lead a community away from past patterns—in other words, that can lead a community to adapt and innovate.

The U.S. cities investigated in this study generally showed signs of at least some innovation, including experimenting with new organizational structures, new positions, and programs for addressing things like climate change and energy conservation, as well as measuring and monitoring trends. Nevertheless, the study's literature review and research finding that less than six percent of U.S. cities have instituted sustainability programs, much less innovative programs, reveals a scarcity of true learning communities in the U.S. when it comes to planning for the long term.

At the same time, it's important to remember that the earliest climate change initiatives grew out of local governance (U.S. Conference of Mayors, 2009). The first sustainability indicators also resulted from grassroots efforts, with the state and federal governments following the lead of municipal experiments. Unlike the federal government, cities are required to balance their budgets. In an effort to get the greatest impact for the dollars, cities often are forced to innovate. Accountability also can drive innovation, as individual city leaders are forced to find ways to meet the needs of their constituent neighbors. Thus, at the local level, innovation often springs from necessity.

The early community sustainability indicator success stories discussed in this chapter (Jacksonville, FL. Santa Monica CA, Albuquerque NM, and Truckee Meadows,

NV) succeeded in establishing goals, frameworks, and indicators. Based on the results of the broad survey of 200 cities and the literature, these four early success stories are now among the few cities that have well developed sustainability indicator programs. In several communities that developed SIs subsequently, the indicators were not implemented, and some were abandoned. The broad survey of 200 cities indicates that, during the first decade of the 21st century, the early generation of community SIs expanded and additional cities emerged as second-generation SI communities. This generation was armed with important new technologies, including websites to communicate program elements and activities more quickly and clearly and GIS mapping to aid in expressing tabular SI lists with corresponding geographic information. The results of this study show that some of the most significant advances by sustainability programs include more integration and the use of holistic approaches, increased federal funding, the use of dashboards, and the establishment of city sustainability offices with overarching responsibility for community sustainability. As stated earlier, less than 10 percent of the cities studied have SIPs that are actually utilized by their local governments. Based on the more recent city documents, that number, however, is increasing. The communities that ranked high among the five-tier sustainability indicator development categories also displayed evidence of organizational learning by including goal setting and explicit monitoring, with formal feedback loops and experimentation in alignment with local planning.

4.6 Conclusion

The present study found that communities that have attempted to develop sustainability indicators have generally been successful in creating lists of indicators under some kind of sustainability framework that enables a community to identify, describe, and translate some of the pieces of the sustainability complex. In a few cities, local indicator projects have enjoyed widespread public involvement and received ample media attention. However, with the exception of a few projects, lists of indicators have yet to become tools that have been taken up in earnest by decision makers. In most cities, sustainability indicators today are much more likely to be found in a file drawer or on a

community's website than in a decision maker's meeting packet. The problem of dormant SIPs holds a central place in the case study presented in chapter eight.

Perhaps one reason that indicator projects have yet to be implemented by the majority of communities who have undertaken the task of formulating them is the "silo"-ing tendency of the indicators themselves. Decision makers might be more likely to integrate indicators into their work if the indicators themselves took a more integrated approach across sectors. For example, if an indicator for education, such as "high school drop-out rates," was explicitly shown to affect another indicator such as "teen pregnancy," decision makers might show more interest. An abstract environmental indicator for "rise in air temperature" might get more attention if it were tied explicitly to a "depth of permafrost" indicator, and then connected to economic indicators showing anticipated decline as a result of truncated tundra travel seasons for machinery critical to expansion of oil and gas exploration in areas of the Arctic. Improving the quality of individual indicators in the future and presenting them as integrated variables will perhaps inspire decision makers to utilize indicators more often and in real ways.

Sustainability indicators should, by definition, capture essential elements of sustainability. Effective SIs must be dynamic in order to match up with a community's values, which change over time. Currently, most indicator projects do not elucidate relationships between systems that are by their nature interconnected. Most SI projects consist of lists of indicators grouped below three to twelve headings. The review of city documents found that, with the exception of a few projects, no analysis of the relationships among indicators accompanies a community's indicator list. Indicators thus tend to more closely resemble a stand of planted trees than a complex old growth forest.

While many cities in the U.S. are currently engaged in sustainability projects in some manner, the approach taken by most communities interested in developing indicator projects to date has been to group issues into individual indicators or domains, without holistic or overarching analysis. This approach of specialization reflects a more general traditional shortcoming in the field of environmental management, where issues have long been institutionalized into separate programs. Not until the early-1970s did

ecologists and other scientists begin to discuss broad interlinked issues such as cumulative impacts and watershed approaches. The literature search and other research of the 200-city sample discovered only 18 cities that had managed to integrate sustainability indicators into governance—and that, among those, only in four cities had sustainability indicators become fully operationalized.

However, the research also tells us that communities and academies across the country are now busy looking into the problem of unsustainable policies by undertaking research using systems analyses, modeling, and other tools to link and interconnect separate indicators. Applying advanced technology, researchers are exploring ways in which modeling and other ways of analyzing systems might be deployed to ferret out, understand, and manipulate linkages among indicators. For example, dashboards with sustainability indicators, such as that employed by the City of Fayetteville, provide a method of viewing several programs at once, thereby presenting an opportunity for decision makers and the public to compare and contrast program trends information. With new discoveries of interdisciplinarity, we can begin to make a shift away from describing and monitoring separate occurrences to holistic sustainability assessment.

Chapter 5: The Role of Sustainability Indicators in Local Decision Making

The city tries to incorporate sustainability into its projects, when possible or affordable, but does not have a system set up to measure sustainability.

Surveyed City Official

5.1 Introduction

The surveys and follow-up interviews employed in this part of the study sought deeper insights into where, why, and in what ways sustainability indicators are currently being used, in pursuit of responses to the second group of research questions:

- To what degree, if any, are cities that have developed sustainability indicators integrating them into ongoing program planning, monitoring, and reporting?
- What are some of the facilitating conditions and barriers to effective SI implementation?

The survey and follow-up interviews conducted in this phase of the study provided concrete examples that were later used in answering how the lessons from other communities' successes may inform ongoing development and implementation of sustainability indicators in Juneau, Alaska.

In the previous chapter's broad survey of 200 cities, several trends were identified and then categorized using a five-tier ranking for sustainability indicator development. Building on those findings, 38 of the cities from the 200 initially investigated responded to an Internet survey, providing data that led to this chapter's findings.

5.2 Methods

From the group of 200 cities (N=200) discussed in chapter four, a proportional stratified random sample of 50 cities was selected. Each was sent a uniform electronic survey over the Internet using the Survey Monkey Internet survey tool. Out of the 50 surveyed cities, 38 cities, representing a proportional stratified random sample, completed and returned surveys.

5.2.1 Pretesting the research instrument

The research plan and, specifically, the draft questionnaire, was reviewed and approved by the Institutional Review Board at the University of Alaska Fairbanks, approval number 171494-2 (*see* Appendix 1). Five individuals, all professionals in

statistics, public administration, or social sciences, and all with many years of experience in qualitative or quantitative survey research, pretested the questionnaire. Each provided comments on the survey's clarity, format, word choice, and length, and this feedback was used to modify the questionnaire.

5.2.2 Final survey instrument

The questionnaire consisted of 40 questions, including multiple choice, yes/no, and open-ended questions (Appendix 5). There were 178 possible answers, including the open-ended questions. Questions were organized into the 11 categories listed in Table 5.1.

Table 5.1 Survey Question Categories. The survey questionnaire included 40 questions in the following 11 categories.

	Categories
1	Introduction (informant's background and informed consent)
2	Terms (used for sustainability) and development of SIs
3	Holistic measurement among city departments
4	Barriers to development and implementation of SIs
5	Data sources used – local, state, and federal
6	City decision making
7	Beyond city government – involvement of residents, private companies, and NGOs
8	Public participation – degree of public involvement
9	Funding – sources of funding for SIs
10	Type of indicators – top 3 environmental, social, economic, public policy, and technology
11	Related issues – reasons for remaining in or leaving community, etc.

5.2.3 Arrangement of responses to individual questions

For convenience in conducting statistical tests, responses to No and Yes questions were ranked respectively as 1 and 2. Questions with more than one choice were given ascending values such as 1 - 5 for Likert scaling. Questions with multiple choices were arranged in ascending value based on relevance to the study's assumptions regarding the role of sustainability indicators in local decision making.

5.2.4 Analysis of questions and coding

Twenty-two of the 40 questions in the survey included open-ended questions. The responses to these open-ended questions were coded (Robson, 2002) with coding schemes developed for each question. Most coding schemes included 1 to 4 codes. Questions 31 through 35 asked for two responses regarding types of indicators used. Consequently, there were up to 23 codes used for these questions.

Coding schemes for some questions included an intermediate step that involved labeling a sentence, phrase, or word representing one or many conceptual categories (Robson, 2002). The word(s) used were descriptive, "in vivo" (i.e. a direct quotation from the response), or more inferential (Robson, 2002). The code or codes were then reduced to a number (Robson, 2002). Once the codes had been entered into the completed response database, they were analyzed using the Statistical Package for Social Sciences (SPSS) software. A list of the questions and codes can be found at Appendix 3.

5.2.5 Survey respondents

One person from each of the 38 responding cities completed the survey questionnaire using Survey Monkey. The majority of the respondents were employees of local government, usually city planners and some sustainability coordinators. In a few cases where the planning function was contracted to the private sector, the person responsible for planning was contacted and asked to respond to the survey. The following criteria were used to select informants:

- Current city employee
- Role in a city planning or sustainability issue such as recycling, energy conservation, or climate change
- If possible, role in a sustainability office or working on sustainability issues or indicators.

Informants were found by using the official city website for each city. The city planning, public works, or environmental agency was contacted after finding their contact information on the city government website. Several phone calls were often necessary to identify the person responsible for sustainability planning or working in a closely related

field, such as long-term planning or environmental or energy-related activities. In the few cases where the city had an office of sustainability or a sustainability coordinator, that office or person was contacted directly. Survey responses were received July and August of 2010. There may be a potential bias in the responses to the questions from the informants that are employed as sustainability coordinators.

5.2.6 Comparisons between response patterns.

A nonparametric, median comparison statistical test was performed to determine if there were a difference in response patterns between cities with SIs and those that do not have SIs (Conover, 1999).

5.3 Results

5.3.1 Relationships between SI tiers and local demographics

In Table 5.2, the 38 responding cities are organized into three groups corresponding to the population-based categories used in the NRDC "Smarter Cities" report. The table also shows this study's five-tier ranking for sustainability indicator development and includes new information on the cities' social and economic conditions in six categories presented for comparative analysis. With the exception of the bond rating information, the social and economic information displayed in the table was taken from the U.S. Census Bureau's 2005-2009 American Community Survey 5-Year Estimates (U.S. Census Bureau, 2010). Population, Gini Index (income inequity), college education, percent below poverty, median age, and employment information all came from the U.S. Census Bureau. The Standard and Poor's bond rating information was taken from the Municipal Securities Rulemaking Board, Electronic Municipal Market Access.

Table 5.2 Social and Economic Indicators and SI Five-Tier Ranking for 38 Cities

	Population	Gini Index	College	Employment	Bond Rating	Median Age	% Below Poverty	SI Tier
Large Cities								
Albuquerque, NM	515,107	.446	32.2	67.5	6	34.3	11.2	5
Anchorage, AK	280,389	.406	32.3	74.3	7	32.2	5.8	2
Kansas City, MO	474,396	.465	29.8	69.0	3	34.9	12.6	3
Lexington-F., KY	287,537	.486	39.0	69.0	6	33.4	10.4	1
Portland, OR	548,988	.467	40.2	70.1	6	35.5	11.0	5
Santa Ana, CA	336,988	.398	11.4	69.0	3	28.2	14.8	3
St. Louis, MO	355,078	.481	14.7	64.7	5	34.5	21.0	1
Medium Cities								
Hampton, VA	145,903	.400	21.2	67.7	7	34.0	9.9	1
Huntsville, AL	172,583	.484	38.4	64.9	7	37.5	10.7	5
Newport News, VA	192,635	.411	22.9	69.8	6	31.9	10.8	1
N. Las Vegas, NV	205,483	.358	15.0	71.2	4	29.5	8.6	4
Savannah, GA	131,872	.487	23.5	59.5	5	32.3	16.6	1
Sioux Falls, SD	151,646	.441	29.7	74.3	6	33.8	7.1	4
Thornton, CO	110,768	.350	25.4	76.6	6	31.8	6.6	2
Torrance, CA	139,976	.420	43.2	66.0	6	41.0	4.4	2
Waterbury, CT	106,909	.459	16.2	64.4	5	34.3	17.2	1
Small cities								
Apple Valley, CA	68,298	.462	16.0	55.8	8	34.9	14.6	1
Bloomington, IL	72,289	0.587	44.7	72.3	5	33.2	8.9	3
Bradenton, FL	53,663	.410	22.3	58.2	5	43.1	9.7	1
Brick, TWN, NJ	78,321	.413	25.3	65.1	6	41.1	3.6	1
Bristol, CT	60,869	.382	19.6	69.7	7	39.6	5.6	1
Buena Park, CA	78.689	.378	25.0	66.1	1	34.1	7.2	3
Carmel, IN	66,654	.448	63.4	72.0	6	37.3	2.4	1
Deerfield B., FL	75,025	.440	22.6	61.4	7	42.2	11.8	1
Dothan, AL	64,734	.480	23.4	60.7	7	37.9	12.7	1
Encinitas, CA	59,818	.464	55.1	70.3	7	40.4	4.7	1
Euless, TX	52,134	.386	30.4	78.1	6	33.8	8.9	4
Fayetteville, AR	72,828	0.55	43.5	68.0	5	28.4	12.9	4
Gulfport, MS	70,238	.458	18.8	61.9	3	33.5	14.1	1
Hoffman Est. IL	51,895	.372	42.1	73.5	7	36.5	9.9	3
Largo, FL	73,966	.402	19.0	54.7	4	48.6	8.9	1
Lorain, OH	70,090	.443	11.1	62.3	8	36.7	20.5	1
Medford, MA	55,633	.408	38.7	67.7	6	37.8	5.5	1
Midland, TX	103,265	.498	26.8	67.4	8	33.2	9.9	1
Minnetonka, MN	50,175	.436	53.0	71.1	7	43.3	2.8	1
Pine Bluff, AR	51,142	.471	18.8	57.7	5	33.7	22.2	1
Piscataway, NJ	52,112	.372	45.0	67.0	6	32.6	2.8	1
Wayne, TWN, NJ	53,812	.419	44.1	62.4	5	42.1	2.3%	1

*Source for city economic and social data: Population (city population), Gini Index (income inequity – distribution of income and deviation from equal distribution), college (% with 4 year college or more), employment (% employed), median age, and poverty (% below poverty level) is the U.S. Census Bureau, 2005-2009 American Community Survey found online at: http://factfinder.census.gov/home/saff/main.html?_lang=en

** Source of the Bond Rating is the Municipal Securities Rulemaking Board, Electronic Municipal market Access. http://emma.msrb.org/. The Bond Rating was assigned a value between 1and 8.

A highly significant correlation was found between sustainability indicator development (SI five-tier ranking) and population, employment, and median age. Using a Pearson product-moment correlation coefficient, these relationships are shown in Table 5.3.

Table 5.3 Cities' Correlated Social and Economic Characteristics. The top number is the correlation coefficient and the bottom number is the p value. Population (0.0012), employment (0.0054) and median age (0.0248) have significant P values.

	Pop	Gini Index	College	Employ	Bond Rating	Median Age	% Below Poverty	SI five-tiers
Population	———							
Gini Index	0.1048 0.5312	———						
College Education	0.0876 0.6012	0.1191 0.2309	———					
Employ	0.2034 0.2207	0.2051 0.2166	0.4181 0.0090	———				
Bond Ranking	-0.1872 0.2603	0.0874 0.6025	0.2000 0.2287	0.0985 0.5565	———			
Median Age	-0.3126 0.0560	-0.1314 0.4317	0.1944 0.2422	-0.394 0.0143	0.1886 0.2320	———		
% Below Poverty	0.2249 0.1746	0.3835 0.0175	-0.6452 0.0001	-0.4414 0.0055	-0.1112 0.5061	-0.3467 0.0330	———	
SI Five-Tier	0.5045 **0.0012**	0.0650 0.6083	0.1391 0.4050	0.4425 **0.0054**	0.1959 0.2345	-0.3636 **0.0248**	-0.0109 0.9480	___

Community size

The five tiers of sustainability indicator development presented above in Table 5.4 show a significant correlation (0.0012) with city population. This finding is internally consistent with findings in the previous chapter indicating that, among the 200 large cities surveyed, larger cities have disproportionately more SIs (Tiers 2 - 5) than do medium and smaller cities. An average of the five-tier ranking for the cities in each size group—small (1.54), medium (2.33), and large (2.85)—also indicates the larger the city the higher the five-tier ranking. This finding is consistent with the statement on NRDC's Smarter Cities Program website to the effect that larger cities have more capacity to take on new programs:

> Cities of various sizes face different problems and have vastly different resources to draw upon. To reflect these differences, we separated our cities into three population categories. Cities with greater resources to draw from performed better across all of the criteria, but that is not an indication that small and medium cities suffer from greater environmental degradation. Larger cities are able to build more green-certified buildings, provide a wider range of energy initiatives to their populations and offer more transportation alternatives—factors that enhanced their scores. (Natural Resources Defense Council, 2009)

Employment and median age

Table 5.4 also shows a positive correlation between SI tier ranking and city employment rates (0.0054), as well as a negative correlation between tier ranking and median age (0.0248). Perhaps SI activity and strong employment rates both correlate to a strong economy wherein higher tax revenues are collected by the city, increasing the resources available to implement programs. Also, more SI activity in cities with relatively high employment may correlate to a community's ability to innovate, since both SI programs and robust job creation require innovative approaches. The SI tier correlation with lower median age could be associated with a higher tendency for innovation among younger populations. Also, higher employment may attract a younger population seeking job opportunities.

Universities

Although not correlated with the percentage of college educated individuals per se, all cities in the high-population category are home to one or more colleges compared with the median and small-population cities that do not all have colleges within their municipalities. Although colleges tend to attract researchers, cultivate knowledge production, and generate innovative programs, certain communities with universities may or may not be more amenable philosophically to sustainability indicator projects and programs.

5.3.2 Cities with SIs in use or in development

Table 5.4 shows the name and population grouping of each of the six cities reporting on the survey to be using or in the process of developing sustainability indicators.

Table 5.4 Cities with Sustainability Indicators. The table displays the size categories and names of the six cities that are using or developing sustainability indicators.

City Size	Name of City
Large	Albuquerque, NM
Small	Bradenton, FL
Small	Fayetteville, AR
Small	Lexington, KY
Large	Portland, OR
Med	Torrance, CA

The percentage (15.8 % or six) of the 38 surveyed cities that are using SIs is relatively close to the percentage (12% or 48) of the 200 cities found in chapter four to have SI activity, suggesting internal validity in sampling methods and results.

5.3.3 Response patterns and median comparisons

Of the 38 cities responding to the survey, six reported using or developing sustainability indicators and 32 reported not using SIs. For the 40 questions included on the survey, a total of 176 responses were possible; however, respondents who indicated their cities did not use sustainability indicators were not asked a follow-up series of questions about SI use while those answering that threshold question in the affirmative were given an opportunity to answer more questions. As a result, representatives from cities with SI projects answered more questions than those from cities indicating they did not use SIs. All respondents, whether they answered having SIs or not, had 67 opportunities to provide responses.

Table 5.5. Response Median Comparisons Summary (Overall Contingency Table). This table shows the results of a nonparametric median comparison statistical test used to determine if there were significant differences between the frequency of responses by six cities with SIs and that of responses by the 32 cities without SIs. The six cities with SIs responded to 61questions above the median response level. The 32 cities without SIs provided six responses above the median. This indicates a significant difference in the frequency of responses from the six cities with SIs compared to frequency of responses from the 32 cities without SIs.

Median response is the median value of the possible answers.	**Cities with SIs**	**Cities without SIs**	**Total # of Responses**
Number of responses: Less than /= Median	**6**	**61**	**67**
Number of responses: Greater than Median	**61**	**6**	**67**
Totals Possible Responses	**67**	**67**	**134**
P Value = 0.005	**Test-Statistic (Chi-Sq) =**	**90.27**	

The difference between the median response of the six cities with SIs and the 32 cities without SIs shows there is a difference in the pattern of responses to the questions answered by each group. The difference is highly significant, as evidenced by the P value of 0.005.

5.3.4. Factors impeding and supporting SI development

Fourteen of the 32 cities that responded to the questionnaire that they do not measure sustainability provided written comments about why they did not.

- 6 are in the process of developing SIs.
- 4 are partially or indirectly measuring sustainability
- 1 cited lack of funding
- 1 asked if [sustainability] cannot be defined, how can you measure it?
- 1 referred to sustainability as something else
- 1 noted a state legal prohibition against smart growth based on sustainability issues

The surveys' discovery that several of the 38 cities have SI projects coming on line or have set sustainability goals supports the finding in the literature review that the number of SIs and SIPs in the U.S. is increasing. Respondents' comments, like those excerpted below, reveal a variety of drivers to be pushing local sustainability efforts forward.

Prompted by climate action plan: *[We are] in the process of preparing a Climate Action Plan, which will provide a baseline for future measurement to sustainability.*

Prompted by process of defining: *Sustainability just became a community goal. I anticipate measurements or evaluation of sustainability in the near future.*

Prompted by sustainability language in comprehensive plan: *Our 2020 Comprehensive Plan has many policies that deal with sustainability. In the future, we will be measuring sustainability.*

Prompted by law: *By state law HB 697, all cities in Florida must adopt policies in their comprehensive plans regarding climate change and smart growth.*

In the following sections, survey results are arranged by respondents' and cities' background sustainability information (including, e.g., sustainability-related activity and stages of defining sustainability), barriers to SIPs, and attributes of SIPs. Crosstabs and cluster analyses were used to illustrate patterns and correlations found in questionnaire responses, including in comments received in response to open-ended questions.

5.3.5 Sustainability-related activity/interest

Two background questions were asked to ascertain the amount of time the respondent spends on sustainability issues (as those issues were defined by the respondent) and to identify the sustainability issues that are important to the respondent and to the government and overall community in the respondent's city.

Informants from the 38 cities indicated that much or most of their time was spent dealing with sustainability issues; for some, sustainability-related activities formally occupied a large portion of their job description. Over 90% of the officials in the six cities that reported using sustainability indicators reported that SIs are considered by local government to be useful.

Table 5.6. Importance of Sustainability Indicators to Local Government. 100% of the six cities with SIs reported that SIs are useful to city government. A total of 90% reported that SIPs are moderately to very important. 69% of respondents reported that much or most of their time is spent working on sustainability issues.

Question	Response Category	Response From (6 cities w/SIs)
Time spent working on sustainability issues	**Much or most**	**69%**
Importance of SIPs	Moderately to very important	90%
SIPs useful to city government	**Yes**	**100%**

Not surprisingly, 100% of respondents from cities with SIPs reported a large portion of their work deals with sustainability.

Informants from all 38 cities were asked to identify key sustainability issues for their cities. Responses are listed in Table 5.7, which also shows the top five of 11 identified sustainability issues. It is interesting to note that a "lack of an approach (program) to sustainability development" ranked as high as jobs and greenhouse gases. This could be a signal that models for developing SI implementation plans as part of an approach for supporting sustainable development are not available.

Table 5.7 Five Most Frequently Prioritized Community Sustainability Issues. Informants from the 38 cities reported the top five sustainability issues for their community, selected from a list of 11 issues included on the questionnaire. Percentages reflect where the issue placed among all 11 listed issues.

Issue	Percentage (Number)
1. Transportation	16.6% (6)
1. **Land use**	**16.6% (6)**
2. Greenhouse gases	13.6 % (5)
2. **Jobs**	**13.6% (5)**
2. Lack of approach to sustainable Development	13.6% (5)

5.3.6 Stages of defining sustainability

More than 57% of the respondents with active SIPs reported that their cities had settled on a definition of the term "sustainability," whereas only 20% of cities without

SIPs reported having arrived at a definition. This finding suggests a correlation between cities that have solved the threshold issue of terminology and those that have been able to move their programs forward. Comments from respondents answering yes to having a definition were grouped into four categories. Based on the respondents' comments, together with data from the review of 200 city websites and associated documents reported in chapter four, cities' definitions of sustainability fall into four general categories: "nonintegrated," "in process," "integrated," and "integrated-plus."

Nonintegrated definitions

Two of the written comments regarding the definition of sustainability reported on the 38-city surveys indicated that the definition of sustainability can be found in goal statements for respondents' city departments, with different sustainability definitions applying in different offices of the same city. Typically, cities with nonintegrated definitions use some iteration of the Brundtland Commission definition of sustainability: "meet[ing] the needs and aspirations of the present without compromising the ability to meet those of the future" (para. 49).

Survey responses indicated that where different definitions of sustainability are used within one city government policies tend to be more disaggregated compared to the relative effectiveness of different offices sharing one overarching definition:

> *While there is not a specific definition for sustainability that informs all city tasks, there are a number of policies where sustainability is a goal or an outcome*
>
> Comment from city official on questionnaire

Definition in process

Some cities indicated they are still in the process of developing a definition for sustainability. Several of the comments from the questionnaires indicated that the city was in the process of developing SIs; as part of that process, some are working toward developing a definition for sustainability.

> *Establishing a policy on sustainability, including a definition of what it means to the City, is currently being explored, and the City intends to expand on sustainability in its next comprehensive plan update.*

[The city] is in the process of defining sustainability and determining appropriate measures for tracking progress.

Integrated definition

Three of the informants providing written comments on the questionnaire relating to sustainability definitions referenced the Brundtland Commission definition or a paraphrase of it that included objectives for the three domains of economy, environment, and social/cultural. Cities in this category generally indicated their definition applies across domains. The three informants used the Brundtland Commission definition below:

The city defines "sustainability" as meeting the needs of the present without compromising future generations' abilities to meet their own needs.

Integrated-plus definition

This category, which encompasses those cities with the most robust definition, was reflected in four of the written comments received from respondents. Typically, the Brundtland Commission's definition is used alongside additional city attributes and, in three cases, reflected integrative properties across the three sustainability domains – environmental, economic, and social. All of the cities using this category of definition were ranked as SI tier 4 or 5. The comments below from questionnaire responses received from these high-ranking cities include additional meaning, such as the American Planning Association definition.

[The city] is a place where the well-being of current and future citizens is supported by a vibrant economy and a self-renewing, healthy environment – a true reflection of sustainability.

[The America Planning Association] definition – A sustainable community persists over generations, enjoys a prosperous economy and a healthy environment, is disaster resilient, and has a vibrant civic life.

As stated above, the cities that ranked 4 or 5 on the SI five-tier ranking for developing SIs also had more specific definitions for sustainability, suggesting that cities that have operationalized their sustainability indicators have defined sustainability.

However, some cities that reported having SIs have not yet arrived at a specific definition.

5.3.7 Perceived barriers to developing and implementing SIs

The significant amount of reported time spent on sustainability, along with the topic "Lack of approach to sustainable development" ranking among the top five issues shown in Table 5.7, begs the questions: Why are only six of the 38 surveyed cities working with sustainability indicators? What barriers to developing effective SIPs are communities encountering? Six questionnaire responses regarding perceived barriers to SI implementation are outlined in Table 5.8.

Table 5.8 Cross Tabs for Cities With and Without SIs. Three main topics—Sustainability Activity, Perceived Barriers to SIPs, and Attributes of SIPs—are used to organize the main responses to the survey questionnaire from 38 city informants. The shaded cells in the far right column represent topics were not offered to the informants that do not have SIs. In the middle column, the descriptors "largest," "large," "some," and "very small" correspond to terms used on the questionnaire. Where there are two descriptors, the percentage is based on their combination.

Survey Topics	6 Cities WITH SIs Survey Responses	32 Cities WITHOUT SIs Responses
Sustainability Activity		
Respondent's job dealing with community sustainability (some part plus large part)	100%	67.9%
Perceived Barriers to SIPs		
1) Has definition for sustainability	57.1 %	20.0%
2) Perceived barriers to using SIs in decision making?	100 %	
3) Perceived barriers to selecting SIs:		
Fiscal	71.4% (large)	
Political & Legal	42.9% (large &some)	
Policy	42.9% (large)	
Organizational	42.9% (some)	
4) Barriers to implementing SIs:		
Fiscal	57.1% (largest)	
Political & Legal	42.9% (some)	
Organizational	42.9% (some)	
Policy	42.9% (very small)	
5) Funding as a barrier to implementing SIs	67%	
Attributes of SIPs		
Holistic measurement	85.7%	
Integration of social programs	57.1%	61.5%
Climate Action Plan	83.3 %	48.0%

Fiscal

Three questions were asked of the respondents with SIs about barriers to establishing a successful sustainability indicator project. The first asked if there were barriers to using SIs in decision making, to which 100% of the respondents answered "yes" (*see* Table 5.8). The other two questions asked if there were barriers pertaining to

selecting and implementing SIs. As shown in Table 5.8, these two questions included four possible barriers to choose from: (1) fiscal, (2) political, (3) organizational, and (4) policy-related. Fiscal barriers were cited most frequently as obstacles to selecting and to implementing SIs. These responses align with written comments received from another question on the survey that asked whether the respondent's city measured SIs:

> *The city tries to incorporate sustainability into its projects when possible or affordable but does not have a system set up to measure sustainability. Severe financial and staff constraints contribute to this situation.*
>
> *[We face a] lack of funding [and] fear that sustainability development standards would stifle economic development.*

Another question specifically asked cities with SIs about their programs' funding sources. The respondents were asked to rank eight sources of funding for SIPs, ranging from local taxes, state, local city enterprise funds, federal, nonprofit organizations, in-kind services, and corporate. The highest ranking sources were from state (50%), and federal (66.7%) governments. Federal grant funds for local energy conservation programs have been used to fund staff positions to coordinate sustainability programs. However, other funding sources included local taxes (33.3%), nongovernmental organization support at (40%) and corporate support at 40%.

Political and legal

Political and legal factors were stated as being the second highest barrier among the six cities with SIs, with 42.9 % for both selecting and implementing SIs (*see* Table 5.8). Statements disclosing related barriers having to do with regulatory obstacles arose in response to a question that asked if city government had developed SIs.

> *State land use law does not permit a municipality to limit or stop growth based on sustainability issues.*
>
> *In the development of a county sustainability plan, the city opted to take state delegation of it and then fold it into regional objectives to meet state legislative directives.*

Based on the survey question about funding and the two questions about types of barriers discussed above, cities with and without SIs reported that they faced fiscal barriers to developing and implementing SIs. It is clear, however, from the percentage of responses to the funding-specific question and comments, respondents feel fiscal, political, and legal barriers are impeding their cities' SIPs.

5.3.8 Attributes of operationalized SIPs

Several common characteristics were reported among the cities that have developed SIPs. Three areas that were reported are a holistic approach toward decision making, integration of social programs, and a climate change or greenhouse gas (GHG) reduction program. The questionnaire received responses and written comments for each of these areas, as outlined below.

Holistic approach

Respondents with SIPS were asked if their economic, social, and environmental SIs were being applied in a "holistic and interdependent fashion," with holistic defined in this study as incorporating economic, social, environmental, technology, and policy aspects into decision making. Of the six cities that have SIPS, over 85.7% of the respondents reported that their programs applied SIs holistically. The survey also asked respondents to express in percentages how a holistic approach was being applied. Results are shown in Table 5.9. Planning received the highest percentage (87.5 %). This seems logical since long-term planning issues reside in comprehensive plans, and sustainability has temporal aspects. Respondents also reported SI were being used in a holistic fashion in several departments, from planning to capital improvement programs. The next highest percentage of use for holistic approaches was for daily decision making and the budgeting process, both at 75%.

The last question asked if the city organizational structure included a main office from which holistic approaches for sustainability indicators were applied. 25% reported having a single or main office from which a holistic approach was being applied to sustainability. From the six quotes received about using one main office for addressing

sustainability, 50% (3) of the quotes suggested that each city department was responsible for addressing sustainability, and 50% (3) named specific departments or a main office.

> *All of our offices attempt to integrate sustainability practices in their work. But the planning and sustainability agency is the main office at the city that addresses sustainability.*
>
> *Planning and public works (city departments charged with addressing sustainability issues).*

Table 5.9 Holistic Approach with Sustainability Indicators. The survey asked two questions of the six cities with SIs concerning if/how their SIs are used holistically. Planning received the highest percentage among six possible answers. 75% percent of the respondents reported not having one main office to oversee their SIPs.

Question Topic	**Response Rate (Respondents from six cities with SIPs)**	
How is holistic approach applied?	Planning	87.5%
	Daily decision	75.0 %
	Budget Process	75.0 %
	CIP Process	62.5 %
	Legislation	62.5 %
One main office for SIs?	No	75%
	Yes	25%

Findings suggest that holistic thinking exists in a high percentage of the cities that have SIPs.

Integration of social SIs with other programs

A question specifically about integration of SIs with other program was asked based on the chapter four findings that a preponderance of cities (134 of 200) had developed documents, programs, and organizational structures pertaining to environmental and economic activity but rarely mentioned social programs. In this chapter's study of 38 cities, representatives from approximately 60% of the cities with SIPs and 60% of those without SIPs reported integrating social or well-being indicators into economic and environmental decision making. Sixteen of the respondents provided a variety of additional written comments (*see* Table 5.10). Several programs listed in Table 5.10, such as those working for housing, elder care, and environmental justice,

were mentioned as priorities, but only a few respondents provided information on what mechanisms these programs are using to interface with SIPs.

Table 5.10 Social and Well-being SI Integration Codes and Responses. The table lists the codes (number) next to the phrased or paraphrase response from 38 cities—with and without SIs—that responded to the survey question about social and well-being integration. The highest response rate was 28.94%, indicating "general non-specific integration" of social and well-being integration of SIs with economic and environmental issues.

Code	**Listed below are literal or paraphrased quotes from the written comment response portion of the questionnaire pertaining to integration of social or well-being indicators with economic and environmental issues.**	**Percentage and number of responses from 38 cities**
1	general non-specific integration	28.94% (11)
2	collaboration with social NGOs	2.63 % (1)
3	low income and energy efficiency	2.63 % (1)
4	elderly and home repair	2.63 % (1)
5	transportation and seniors	5.26% (2)
6	water and local food production	2.63 % (1)
7	health impact assessments	2.63% (1)
8	looking at overlay zoning with sustainability	2.63 % (1)
9	environmental justice	2.63 % (1)
10	several specific human health development indicators	5.26 % (2)

A few cities used a matrix, or if required by the National Environmental Policy Act (NEPA) process or some other federal requirement, were preparing to use GIS to integrate social issues with land use and environmental issues, as quotes from respondents below indicate. For the most part, however, respondents were silent on the existence of social or well-being indicators and broader integration of those programs.

> *There are a number of nonprofits and community/resident leaders that the City has collaborated with to factor healthy community concepts into city policy and programs.*
>
> *City is using a matrix to determine whether or not indicators are met.*
>
> *An overlay zoning district along the banks of the river that would take into consideration the environmental, social and economic needs of the citizens--this zoning concept has not progressed beyond the decision stages.*

Climate change programs

A question was asked about climate change, in light of the significant amount of ongoing discussion and activity taking place around this issue. Cities with SIPs responded that 83.5% have a climate change program; for 33.3% of those cities, climate change is part of the city's SIP. Of the cities that do not have SIPs, less than half (48%) have climate change programs.

5.3.9 Public participation

Respondents from the six cities with sustainability indicators were asked five questions to measure the perceived importance of their cities' sustainability efforts to the general public and to identify perceived sectors of the public that tend to engage with SIPs. Responses varied (*see* Table 5.11). Generally, the respondent provided information on who was making use of the city's indicators, including individuals, NGOs, private entities, and the general public.

Table 5.11 Public Engagement with Sustainability Indicators Projects. The survey questionnaire asked the six cities with SIs five questions about public involvement in their projects and programs, including non-governmental organizations (NGO). Importance of public participation (72%) and communications using the Internet, including social networking (75%), received the highest response rates.

Question Topic	Response Rate	
Importance of SI and SIPs to individuals	Important	57%
Importance to private sector	Important	57%
Importance of public participation	Important	72%
How communicated to public	Internet/social network	75%
	Report document	50%
	Internal govt report	25%
	NGO report	13%
How important in NGO decision making	Important	33%

These responses indicate that a significant percentage of cities with SIPs perceive public engagement to play a role in SI development. This finding is consistent with the assertion in the literature that a key component of sustainability is normative and that, therefore, public values are as necessary as empirical data to developing an effective SIP.

5.3.10 Periodic review

Sixty-three percent of those surveyed who are using SIPs reported that their cities perform some kind of review of their SIPs internally. Fifty percent of the respondents use residents' feedback and surveys but report no formal evaluation process in place at this time.

5.3.11 Role of leadership

Sixty-two percent of the participants agreed, and 25% strongly agreed, with the statement "Local leaders support sustainability indicator initiatives in my city." This high number is difficult to reconcile with the small percentage of cities found to have SIPs in the 200-city investigation (12%) and on the 38-city surveys (15.8%). While the discrepancy may be owing to respondents' interpretation of the term "leadership" (e.g., nongovernment community leaders may support SI initiatives, while support may be weaker among government officials, or the leadership within the respondent's planning department may be supportive, but elected officials or high-level bureaucrats may not be behind the SI effort to the same degree), the responses may point back to the barriers elsewhere cited by survey respondents, such as fiscal considerations, as underlying the low incidence of SI programs in the U.S., rather than lack of leadership or perceived lack of leadership.

5.3.12 Information sources used to develop SIs

Data sources that cities use to develop sustainability indicators varied, ranging from locally available data to drawing on other local, statewide, national, and, to a lesser degree, international data sources. The importance of this finding may be that cities need some assistance from outside resources. This may particularly be the case with smaller cities that have fewer resources to gather data. Also, there may be contextual information, such as regional or national trends, that may have impacts on a community and are therefore important to consider when considering community sustainability.

Table 5.12 Sources of Data Used to Develop Sustainability Indicators. The information in the table was provided by the six cities with Sustainability Indicators, and shows communities using local data as well as other sources to formulate SIs.

Data sources	**Local**	**100%**
	Other communities	**50%**
	State data	**57%**
	National data	**42%**
	International data	**14%**
Data updates	**More frequently than annually**	**50%**

A question pertaining to how often SIs are updated produced a variety of answers, with most communities that use indicators updating them annually or more frequently. This suggests that SIs require a continuing local commitment (time and otherwise), and that other sources of information, such as state and national data, are needed.

5.4 Cluster Analysis

A cluster analysis was performed to identify the ways in which the cities could be grouped according to their response data. These city clusters were compared to the study's five-tier sustainability indicator categories (*see* chapter four) to determine if the two data sets bore any relationship to one another.

Responses to the electronic survey provided information regarding local engagement with SIs, including who is or is not using SIs and who has plans to in the future. Survey results were then further analyzed to determine if questionnaire responses could support the grouping of cities according to their similarities or differences using a cluster analysis. Survey date from the 38-city respondents were coded and entered into the SPSS classification and hierarchical clustering analysis program.

Two statistical analyses were run in the SPSS. The first analysis clustered the 38 city responses and displayed the nested clusters using a dendrogram. Eight different nested clusters (A - H) can be grouped, as shown in Figure 5.1, facilitating the formulation of the following narrative analysis made after reviewing each city's response within each cluster.

5.4.1 Clusters, city size, and SI tiers

Most of the cities in Nest A left several questions unanswered; however, some commonalities appeared. All the cities in Nest A were medium and small-sized cities. As

shown earlier in this chapter, city size correlates with SI-tier, with larger cities generally occupying higher sustainability tiers.

As mentioned earlier, the questionnaire was designed to automatically refer a respondent to additional questions at the end of the questionnaire depending on initial responses, thus avoiding the interpolation of a series of irrelevant (unanswered) questions following each negative response. We can see how this rationale held up in the example of the respondent from the City of Bradenton, CA, which does use SIs. The respondent was given the opportunity to answer many more questions, but answered only a few of those, so the city ended up in a nest with other SI users that had only answered some of the questions.

The cities appearing at the other end of the dendrogram, in Nests F, G, and H, appeared to share more relationships, perhaps because those cities completed most of the survey with similar responses to questions about types of indicators used. Their residing in similar clusters may thus be an artifact of the questionnaire structure. As may be expected, five of these eight (63.5%) are using SIs and are thus ranked in the highest SI tiers.

5.4.2 Comparison of SI five-tiers and clusters

The highlighted nested clusters (A – H) on the right column across from the listed nested cities in Figure 5.1 are listed with the SI five-tier ranking. The overlay of tiered cities on nested clusters was designed to determine if there was any statistical or other relationship between the city's five-tier ranking and the clusters. No evidence was found of a meaningful relationship between the SI five-tier ranking and the nested cluster of cities. Nest H appears to contain the most cities with similarly tier ranking, with four out of five of the cities in H ranked in Tier 1. The reason for the lack of strong relationship between SI ranking and nested clusters could be that the rankings were focused on SI development in each of the cities and the nested clusters were based on the responses to all of the questions answered by all of the cities, including responses to questions about general sustainability issues. Visually comparing the other eight nested clusters to the questionnaire responses, there did not appear to be other obvious reasons for the nested

clusters other than city size at the top and bottom of the dendrogram clusters and percentage of tier rankings. These findings are supported by earlier findings regarding the significant correlation between city size and SI tier ranking.

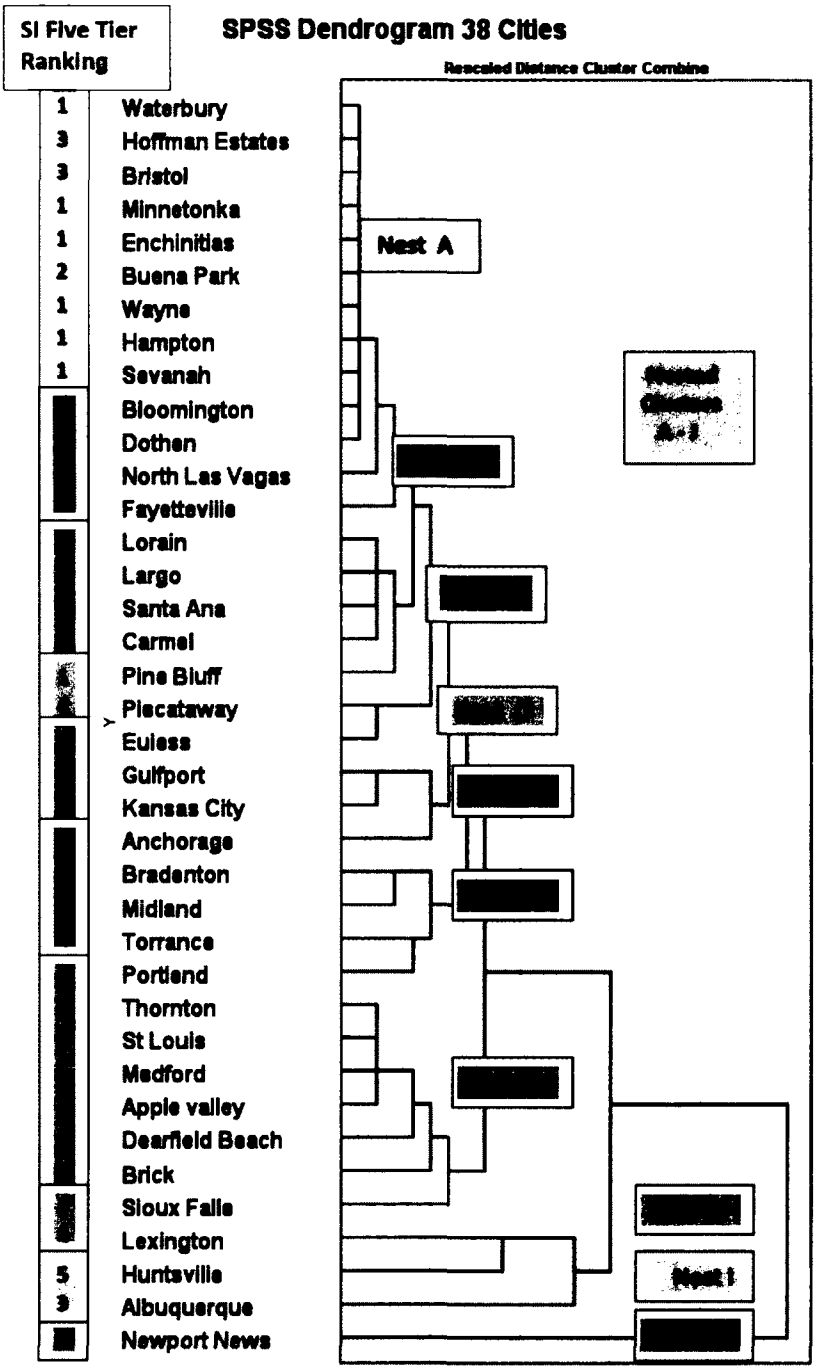

Figure 5.1 Dendrogram for 38 Cities Using Average Linkage with SI Five Tiers. The 38 cities are listed above showing their ranking using the five tiers for SI development. Next to the SPSS dendrogram, the nested clusters A-J have been labeled. There does not appear to be a relationship between the five-tier ranking and these nested clusters.

5.5 Defining Sustainability

As discussed in chapter one, defining sustainability for a long time has proved problematic for theorists, economists, and environmentalists, in large part because of the competing interests and intangible parameters of these disciplines. However, as described above, some cities are successfully breaking down the definition into concrete, short-term steps, and using indicators to do so. It appears from the findings that it is more likely that cities that fall into integrated and integrated-plus definition categories are more likely to operationalize and use SIs.

To illustrate this relationship, an analogy to other city programs can be drawn: for example, local health care programs or environmental programs have well-defined objectives with definitions. These programs also use indicators such as percentage of cancer or air pollution levels. It may then be said generally that for a city to successfully develop and implement sustainability indicators, it must first formulate basic sustainability policy, including agreed-on definitions. If the sustainability indicators are developed before a program has been conceived to implement them, where will the SIs find a nurturing home?

On the other hand, in the 200-cities investigation and in the survey respondents' comments, we find that most cities are conducting substantial environmental work without defining the concept of sustainability. Sustainability can be a helpful concept in that it posits the long-term planning goal of a social environmental system in balance. The cities that have united around integrated and integrated-plus definitions closely associated with the Brundtland definition appear to be successfully gathering many different environmental concerns under one overarching value that supports long-term planning across social, economic, and environmental realms. While SIs do not guarantee a successful sustainability program, they provide city planners a means of navigating often uncharted waters.

5.6 Summary of Findings

The following list summarizes the major findings of the surveys of expert informants from 38 cities:

- There is a significant relationship between SIs tiers and city size.
- A small percentage of cities have SIPs (15.8%).
- There is a lack of an approach (model) for operationalizing SIPs.
- Fiscal, political, and legal barriers exist to developing SIPs
- SIPs were reported to be important to several aspects of city governance
- Cities that define sustainability generally have SIs; cities without definitions are less likely to have operationalized SIs
- Integration of social programs with other domains was not defined.
- Lack of relationships between SI tiers and clustered groups may be due to the questionnaire organization.

5.7 Conclusions

Communities interested in measuring sustainability in this study became fairly successful in creating lists of indicators under some sustainability framework, thereby providing a way for the community to identify, describe, and translate aspects of the complex web of conditions surrounding sustainability and local efforts towards sustainability. For the most part, the process of creating the indicators for those communities that have taken on this task has reportedly been valuable to communities in leading them to discover measurable trends and relationships among the three domains of sustainability. However, with the exception of a few places around the country, indicator lists are rarely used by cities and therefore seldom find their way onto the desks of local decision makers. With few models available, developing useful indicators that lend themselves to meaningful tracking and monitoring can be expected to continue to present a challenge to government officials and the public alike.

Chapter 6: Attributes of Three High-Ranking Sustainability Indicator Programs

You can't manage what you can't measure.

City Planner, phone interview

6.1 Introduction

In the survey discussed in the previous chapter, three of the 38 cities stood out as having exemplary SIPs that contribute concretely to sustainability decision making. These cities—Albuquerque, New Mexico; Portland, Oregon; and Fayetteville, Arkansas—ranked high both in this study and in the NRDC report. Following up on the electronic survey, telephone interviews were conducted with planners and other officials from these and other high-ranking cities to identify with more precision some of the means through which high-performing cities have operationalized their sustainability programs.

Each of the three cities discussed below approached community sustainability in a different manner, reflecting each city's unique characteristics, ranging from strong leadership unique government structure with council members' scope of control encompassing the city's departments, to integration of sustainability concepts, including the use of indicators, into traditional comprehensive planning. Though diverse in their approaches to governance, each of these three cities has much to tell us about how sustainability indicators may be effectively developed and integrated into local planning in meaningful ways.

6.2 Methods

Albuquerque, Portland, and Fayetteville were selected from the 38-city survey sample based both on their high ranking by NRDC and because they ranked in tier four or five of the five-tier sustainability indicator categories developed as part of this study and discussed in the previous chapter. Among the highly ranked cities, Albuquerque and Portland have the most advanced sustainability indicator programs. Fayetteville was selected not only for its sustainability innovations, but because it is closer in population to the case study city of Juneau and because it similarly has a university. A total of seven informants—two to three officials from each of the three cities—were interviewed by

telephone in December of 2010. Each of the informants had completed the questionnaire survey reported in the previous chapter or was familiar with the questions. Informants were selected based on the same criteria used for questionnaire respondents in that each was a city employee working as a professional planner or in the city's sustainability program.

The purpose of the phone interviews was to clarify responses to the questionnaire and to gain additional information about how SIs were used. All were initially asked to provide examples of ways sustainability indicators were being used in their local government. Follow-up questions were then asked, based on their responses to the questionnaire. Notes from the telephone interviews were written down and summarized; the interviews were not audio recorded. The interviews were short (five to 10 minutes in duration), and loosely structured to allow informants an opportunity to elaborate on the answers provided on the questionnaire. The written notes from the phone interviews were analyzed with the responses to the questionnaire to help understand their responses to the questionnaire. Content analysis was performed using the same coding that was used for the questionnaire responses submitted by the officials from all 38 cities.

6.3 Characteristics of High-Ranked Sustainability Cities

In interviews with informants from three high-ranked sustainability cities—Albuquerque, Portland, and Fayetteville—eight major characteristics, listed below in Table 6.1, and several common threads came to light. These characteristics are summarized below with excerpts from the interviews and further supported with information collected in other parts of the study, such as that gathered from the city's website or from the results of the 38-city questionnaire.

Table 6.1 Characteristics of Cities Ranked High for SI Development. Three cities that ranked high (Tier 5) for sustainability indicator development (Albuquerque, NM, Portland, OR, and Fayetteville, AR) revealed a total of eight characteristics of a successful SIP.

Strong Leadership
Innovative Holistic Integrators
    Electronic Monitoring & Reporting
    Interagency Teams
    Dashboard Lite

Strategic and Urban planning
Government Commitment
Outcomes-based Approach
Program Alignment and Transparency
Regular Reporting
Innovative Government Organization

6.3.1 Strong leadership

In the City of Albuquerque, a noticeable push to create a sustainability program occurred under Mayor Martin J. Chavez's leadership, beginning in 2001. Albuquerque has a "strong mayor" form of government.

> *Under the leadership of the mayor, the city began its work on institutionalizing sustainability by conducting public meetings.*
>
> *Informed by constituents through these public meetings, as well as by experts, city officials established city-wide sustainability goals, measures, and an administrative framework, including protocols that remain in use today.*
>
> City Planner, phone interview

Since the mid-1990s, Albuquerque has walked the talk by developing a sustainability program that has received several awards from state officials and other organizations for its leadership and innovative sustainability achievements (City of Albuquerque, 2011). The awards span the areas of energy conservation, sustainable building practices, water conservation, and alternative transportation. For example, in 2008, the U.S. Chamber of Commerce and Siemens honored Albuquerque with a

Sustainable Community Award for its AlbuquerqueGreen program. The City of Albuquerque accomplishments listed on its website include a comprehensive sustainability plan backed by the city's administration that provides the vision and tools for energy conservation, clean energy production and use, and conservation technologies (City of Albuquerque, 2011). As noteworthy as are Albuquerque's very visible projects, which include green building practices, its accomplishments when it comes to institutionalizing sustainability in city government are even more striking. Albuquerque is one of the few cities that have established overarching sustainability goals, implementation protocols, and measures or indicators.

For Fayetteville, Arkansas, leadership in sustainability was reported by informants as occurring in spite of the national financial crisis that has affected their local economy.

> *In these hard budget times, it says a lot about our elected officials that they continue to invest for the long term. Both elected officials and city staff continue to pull together to move sustainability forward. We have young leaders and elected officials that are environmentally minded.*
>
> Fayetteville planning official

Progressive activities that have continued to advance in Fayetteville in spite of today's economic challenges include the adoption of new ordinances for streamside protection around riparian areas, new forms of zoning districts, and mapping green areas for potential connection of wildlife corridors. One Fayetteville planning official I interviewed talked about the role necessitated by strong leadership during fiscally lean times when tendencies to short-term planning inevitably arise:

> *Also, the city council knows that you have to plan, and that takes a certain amount of investment. Fiscal constraints are very powerful and can be very convincing for short term thinking – however [they can bring on] a step-back mentality.*

Because SIs are a relatively new tool and implementation may involve novel approaches, strong leadership is necessary.

6.3.2 SIs as holistic integrators

Interagency teams

A group of managers for the city of Albuquerque was assembled as a "Green Team" and worked for several years, meeting quarterly up to the fall of 2010. During that period, a framework with goals and indicators was established and operationalized within all city agencies. The Green Team served as the principal group that reported to elected officials and city administrators on the city's sustainability progress.

As part of the AlbuquerqueGreen program, existing measures relating to sustainability were re-evaluated, applying a holistic approach using longer-term objectives. These became the indicators for the program.

> *In developing the city sustainability program, we took a look at what we do day-to-day, found those things that we tracked already, and modified the sustainability indicators slightly to track and measure those against the sustainability goal.*
>
> Albuquerque City Planner

The below two examples, reported during a telephone interview with an Albuquerque planner, demonstrate ways in which sustainability indicators have affected decision making in Albuquerque in the areas of alternative fuels for the city fleet and waste management:

> *Alternative fuels:*
>
> *By reviewing and monitoring the percentage of alternative fuels, staff has become more aware of fuel usage, which has led to increased use of alternative fuels.*
>
> *Waste management:*
>
> *Before establishing measurements and indicators through its sustainability indicator program, the city had stated no goals nor established measures for its solid waste management. It was estimated that the diversion rate of generated waste was about 2 percent prior to institution of the indicators. Since the city began measuring the rate's progress, the diversion rate has continued to increase and today is at 6 percent. The city has set a diversion rate goal of 25 percent; an institutionalized desire to reach that goal has resulted in shifts in policy and new*

activities and strategies and has helped to sustain a high level of awareness of the issue.

Additionally, the informant reported that almost all city expenditures are tracked; the key question city administrators ask themselves, he said, is "Is this product sustainable?" Products the city buys, such as paper, ink, and office furniture are all measured and monitored for their sustainability impacts. Another city measure concerns energy consumption. Every city facility now uses an internal website to track consumption, and each facility is responsible for its consumption reduction goals. Using sustainability indicators to measure and monitor these activities has changed employee behavior both at work and at home.

Another example of how the city is operationalizing its sustainability indicators can be found in its development permit (building permit) approval process. Based on this study's results of surveying 200 cities using the Internet and the questionnaires of 38 cities, Albuquerque has one of America's leading green building programs, called the "Green Path," which includes building code updates that require higher energy performance along with a strong incentive program to encourage green building (Whitelaw, 2010). The Green Path exemplifies the city's interdisciplinary approach, whereby the city provides incentives focused on reducing development costs for green building in order to move the community closer to reaching its sustainability indicators. Some of these innovative features include financial incentives, reduced impact fees, public recognition in city communications and advertising, and an expedited permitting process for green projects (City of Albuquerque, 2011). Developers interested in green building can apply for an integrated plan review process that requires the building to meet additional green building standards such as the United States Green Building Council's LEED certification. It is reported that permitting time is cut in half when the integrated plan review process is used. Currently, the city is moving toward a paperless permit review, as reported by the Senior Planner for Albuquerque—another outgrowth of sustainability goals and measures. Staff uses the Green Path system to track the number

and size of green building projects, with one million sq. ft. of green buildings permitted in 2008, representing 15% of all new construction (Whitelaw, 2010).

In November 2009, a change in city administration occurred. Because of the national economic downturn, at present, the program's priority is being re-evaluated. The administration appears to be retaining most of the "AlbuquerqueGreen" program, however, as signaled by the continued presence of sustainability on the city's website banner. Notably, though, the website no longer posts the innovative graphic description connecting the sustainability goals and measures. The basic sustainability framework and protocols of measurement and monitoring continue, though. According to the former Sustainability Director for the city, expansion of the sustainability program is at a standstill for the time being due to the city's financial pinch. The Office of Sustainability does still exist and the website that remains includes an outline of the different sustainability efforts, including Sustainable Water, Green Buildings, Energy and Emissions, Forestry and Agriculture, Transportation, Land Use, Recycling and Waste Reduction, and Leadership, Education, and Outreach.

> *We try to take a holistic integrated approach in measuring sustainability from an economic, environmental, and social perspective.*
>
> Planner, phone interview

It is not new to say that integrated, interdisciplinary solutions provide the best means of tackling difficult and complex problems like those presented by local sustainability issues. It is still rather new, however, to create processes and tools consciously and methodically to enable such integration to occur (Newman et al., 2009). When developed with the intention of each indicator having an integrative function, and when accompanied by a tracking mechanism such as a dashboard that presents the indicators in a holistic fashion, sustainability indicators take on a holistic function, ensuring ongoing opportunities for their meaningful integration into planning processes.

Dashboard Lite

The sustainability indicators that guide Portland's Bureau of Planning and Sustainability, as well as those affecting others of that city's bureaus, have been tracked

for the past five years. Although a consolidated list across the major bureaus has not been developed, numerous examples of how the indicators have affected city policy can be found. Portland's disaggregated list (not one overarching list) of sustainability indicators could be referred to as a "dashboard lite" approach, in that they measure sustainability goals and issues but do not report holistically. During 2009, a new effort was initiated to involve the community as well as the city government in establishing goals and indicators. Nonprofit organizations, residents, and representatives from the city and county formed a partnership, the Sustainable City Government Partnership, to develop a consolidated sustainability plan for the entire community of Portland. In conjunction with the first year of the Sustainable City Government Partnership, the City will adopt formal city-wide sustainability goals and indicators.

> *The process of developing the dashboard of sustainability indicators is proving to be a very political process. Which do you choose? Do you do a short list or a comprehensive list?, etc. It is very difficult to get to a dashboard; ultimately it is up to the decision makers to determine the measure to be used.*
>
> *The current indicators are more for reflecting what has happened and less as a decision making tool. There is a general interest in visiting these measures as tools. However, no one consolidated dashboard exists.*
>
> Portland City Planner

Social sustainability metrics

In Fayetteville, as in many other communities, goals and metrics for social sustainability are proving somewhat difficult to associate with economic and environmental SIs. However, there is evidence that the city's planners and social scientists are somewhat on the same page. One goal, according to one interviewed city planner, is to create "good neighborhoods wherein you can age in place." This broad objective of connecting the built environment with social well-being speaks well of the direction in which Fayetteville is heading. As discussed earlier in this study, however, for most cities, as supported by responses reported in the previous chapter's 38-cities questionnaire, integrating social sustainability with economic and environmental

sustainability represents a major challenge—a challenge Fayetteville appears better positioned to meet than many.

Monitoring and reporting via electronic media

In this study's survey of 200 cities, Albuquerque was one of the few cities found to display sustainability information with such prominence on its website or in other materials. Between 2007 and 2009, Albuquerque developed and posted on its website one of the most innovative graphical and interactive descriptions of community sustainability goals, programs, and measures of any U.S. city. The city's web page clearly lists sustainability in its header and in other sections links overarching sustainability goals with city programs, activities, and measurements, including a link for resident feedback on the measures and issues. The innovative site, which was developed as part of the "AlbuquerqueGreen" program, represents an important piece of the strategic sustainability plan for the whole community. The city's sustainability plan outlined the city would meet commitments, including the U.S. Mayors' Climate Action Charter and Architecture 2030 Challenge and many other campaigns, through an integrated approach to land use, transportation, buildings, open space, and other aspects of community development practices in city and community activities (Whitelaw, 2010).

6.3.3 Strategic and urban planning

This study's web research found that Fayetteville's Strategic Planning and Sustainability Group planned to conduct an annual strategic planning session, with a session set for December 2010 to review the prior year's goals and measures; the website stated it would then publish a report in January 2011 with revised and/or new goals and measures for the next year.

According to its website, the city identified six "Areas of Emphasis" to frame and guide its sustainability efforts in 2009 and into the future:

Table 6.2 City of Fayetteville's Sustainability "Areas of Emphasis." The six "Areas of Emphasis" listed are the topics used by Fayetteville in 2009 to frame and guide the city's sustainability efforts (City of Fayetteville, 2009).

Community Participation & Advocacy
Ecosystem services
Land Use and Planning
Public Health
Resource Efficiency and Conservation
Sustainable Economy

For the past several years, the Strategic Planning and Sustainability Group of Fayetteville has reviewed city performance using these six "Areas of Emphasis." Sustainability indicators associated with each of the areas are used to measure and track progress and accomplishments from the previous year. New indicators may be added or special topics with indicators dropped based on the prior year's performance. The group meets at least monthly with representatives from other city departments to discuss and review the departments' progress using the areas of interest and sustainability indicators. The group also uses the monthly meetings as an opportunity for training.

6.3.4 Government commitment

A planner at the City of Portland reported that the state's efforts had had a trickle-down effect on Oregon's regions and the cities. The government's statewide indicator project, "Oregon Shines," has produced hundreds of indicators as part of a benchmark performance report for the Oregon Legislature, which, beginning in 1989, created the Oregon Progress Board and tasked it with the creation of a strategic plan that would set goals in three main areas:

1) quality jobs for all Oregonians;
2) safe, caring, and engaged communities; and
3) healthy, sustainable communities. (Oregon Progress Board, 1999)

The formulation of an extensive range of statewide indicators with benchmarks was unique among the states at that time. Many states have strategic plans; not many have extensive indicators.

The Bureau of Planning and Sustainability (BPS), one of Portland's major departments, serves as the main bureau for Portland's land use, planning and sustainability activities. The BPS focuses on building partnerships among and conducting training within city departments and between city departments and local businesses. It also monitors and leads most of the city's sustainability activities and projects (City of Portland Auditor's website, 2011). The Bureau also serves as a point of contact for information on sustainability. In contrast to Albuquerque and Fayetteville, Portland has not institutionalized a set of overarching sustainability indicators or set up a dashboard of core indicators that apply to all of the city bureaus. The BPS itself does operate under sustainability indicators and measures however. Outside of the BPS, sustainability indicators are disaggregated among other city bureaus. Some other bureaus are using those established for the BPS while others have developed their own, with BPS assistance—the Bureau routinely assists other agencies with indicators and sustainability activities. According to one planner,

> *[t]he current indicators are more for reflecting what has happened and less as a decision making tool. There is a general interest in visiting these measures as tools. However no one consolidated dashboard exists.*

On its website, the BPS lays out objectives and a set of principles for planning and for sustainability programs, all in service to the goal of "creating a prosperous, equitable, and healthy city." In this spirit, the Bureau of Planning and Sustainability builds partnerships, engages, inspires, and educates residents and businesses, and advances policies, programs, plans, regulations, and urban design initiatives that foster both innovation and practical solutions (City of Portland Auditor's website, 2011). The Bureau has established Sustainable City Principles with targets, summarized in Table 6.3, that all staff members have been directed to pursue.

Table 6.3 Portland Bureau of Planning and Sustainability. The sustainability city principles in the left column are listed with targets that include goals as numeric or narrative actions. The targets are examples of city sustainability indicators. (City of Portland SEA Report, 2010).

Sustainability City Principles	Targets (sustainability indicators)
Global Warming	Reduce City government GHG emissions to 10% below 1990 levels by 2010.
Energy	Invest in all energy-efficiency measures with paybacks of 10 years or less. When available, procure products that meet or exceed Energy Star criteria for energy efficiency.
Paper Use	Reduce paper consumption by 15% below FY 03-04 levels by 2008. All paper products purchased by the City meet EPA procurement and recovered materials guidelines, such as 30% post consumer recycled content. 10% of all paper products purchased by the City exceed EPA procurement and recovered materials guidelines, such as 100% post consumer recycled content.
Procurement	Comply with purchasing guidelines developed by the Sustainable Procurement Strategy.
Toxics Reduction	By using the Precautionary Principle as a framework, replace toxic substance, materials and products of concern with viable least-toxic alternatives by 2020.
Green Building	All newly constructed City facilities are LEED for New Construction (NC) Gold, and all existing buildings are LEED for Existing Buildings (EB) Silver. All tenant improvements to City facilities are LEED for Commercial Interiors (CI) Silver and/or G/Rated Tenant Improvement Guide certified. All new roofs are an ecoroof for a total of 70% coverage, with the remaining roofing Energy Star rated. All replacement roofs are ecoroof and energy star reflective.
Waste Prevention And Recycling	Achieve a recycling rate of 85% by 2015. Waste prevention goal: no increase in the volume of the waste stream, including recycling.
Peak Oil	Strive to reduce oil and natural gas consumption (community-wide goal = 50% by 2030). Expand non-fossil fuel transportation options and use of alternative fuels.

Five-year trend information provided for several sustainability activities, listed in the City of Portland's Service Efforts and Accomplishments (SEA) Report and shown in Table 6.4, include workload, efficiency, and effectiveness measures (City of Portland SEA Report, 2010). As one city planner pointed out, "you can't manage what you can't measure."

Table 6.4. Examples of Portland's Outcomes-Based Measures. The Workload Efficiency and Effectiveness Measures, from the City of Portland's Service Efforts and Accomplishment (SEA) Report (2010), provide examples of outcomes-based sustainability measures.

Workload Measures
Garbage produced (estimated thousands of tons)
Waste recycled (estimated thousands of tons)
New Housing units in city and in total Urban Growth Boundary (UGB)
Percent of UGB total in city spending per capita
Efficiency Measures
Monthly residential garbage and recycling bill for 32-gallon can (adjusted)
Per capita residential energy use (millions British Thermal Units, BTU)
Global warming emissions of CO_2 equivalent (Goal: 10% < 1990 level by 2010)
Change in emissions per capita since 1990
Effectiveness Measures
Certified green buildings in Portland
City government electricity use supplied by renewable resource (goal 100%)
Electricity customers who buy renewable energy
Recycling rate (percentage of all waste): residential, business

6.3.5 Outcomes-based approach

The BPS website lists several sustainability indicators that have been reported for several years and that have played a role in public policy. Good examples of the BPS's effects can be seen in the city's transportation policy and energy conservation policies, as reported by a Portland planner during a phone interview.

> *On transportation: A primary indicator seeks to reduce vehicle miles traveled per person. It has affected transportation policy, specifically causing increased investment in public transportation and more walkable neighborhoods . . . Street car infrastructures, specific corridors as barriers, increasing connectivity, and parking policy have all been affected by sustainability measures.*
>
> *On energy conservation:[W]e do look at metrics for energy conservation – how many megawatts of solar installed, education; [we develop] incentive programs and then monitor the goals on a quarterly basis. By creating the metrics for energy conservation and monitoring them quarterly, we determine if the policies and incentive programs are working. Sustainability indicators provide a way to see the direct impact of the programs while more general indicators were tracking long-term impact.*

6.3.6 Transparency

Researcher Cynthia Williams notes that the concept of transparency is mercurial (2005). Williams also sees transparency in organizations as synonymous with openness and relates transparency with organizational outcome. One of the impressive aspects of Fayetteville's sustainability program is how it has used sustainability indicators for reporting. The annual Sustainability Goals and Metrics Report is published together with the status of the city's sustainability efforts, indicating the city agency responsible for implementing specific goals (areas of emphasis) and including the rationale for (intent of) the goal, metrics (sustainability measures used), and results. The linkage and alignment between goals, intent, metrics, and results is presented to upper city management and the city council and is provided online to the public annually. In some cases, the activities are reported monthly and discussed among the strategic planning and sustainability team. Perhaps the most impressive aspect of Fayetteville's reporting system is that results for each metric include positive outcomes, implications of no action, experienced and expected obstacles, and periodically revisiting the question of whether the goal should be continued or abandoned. The publishing of results, including disclosure of no action alternatives and obstacles, demonstrates a transparent approach to governance.

All of this transparency and reporting signals the presence of mechanisms for feedback and learning that are so important during this early stage of sustainability program development. The fact that new programs are perpetually being considered and old indicators questioned demonstrates willingness by city management to adapt—an attribute essential to any city's ability to move forward toward its sustainability goals. A city must be able to report not only successes but also the things that do not work, and be willing to make appropriate changes.

Fayetteville associates several types of sustainability metrics (indicators) with each of its six areas of emphasis. The two examples provided below, taken from the city's 2009 Sustainability Goals and Metrics Report, clearly show transparency and alignment between a goal and results, using the metric or sustainability indicator (City of Fayetteville, 2009).

Table 6.5 Fayetteville's 2009 Sustainability Goals and Metrics Report Excerpts. Two examples; 1) Land Use and Planning and 2) Resource efficiency and Conservation from the City of Fayetteville's 2009 Sustainability Goals and Metrics Report are listed below. These illustrate how the metric (sustainability indicator) is used in program management and planning. (City of Fayetteville, 2009)

First example

Area of Emphasis:	Land Use and Planning
Division	Sustainability
Recommendation	Update the Master Trails Map, the Transportation element of City Plan 2025 and the Unified Development Code in order to update the FATT Plan
Intent	Provide alternative transportation and greater recreation options in Fayetteville
Goal	To develop a comprehensive trail policy that addresses trail easement acquisitions for multi-family, residential, and commercial developments, updates and adopts an amended Master Trail Map, amends the Master Street Plan section of City Plan 2025 to recognize the trail system as a transportation component, and codifies trail development standards in the Unified Development Code
Metric (Indicator)	1) An amended Master Trail Plan Map. 2) An amendment to City Plan 2025 to add the Trail Master Plan as a transportation component in the Master Street Plan. 3) Amendments to the Unified Development Code to codify trail development standards and easement acquisition in the planning review process through a rough proportionality assessment similar to the City's street improvement policy.
Result	The Master Trails Map was updated and combined with the Master Street Plan and together were adopted in September 2009 as the Master Transportation Plan.

Second example

Area of Emphasis	Resource efficiency and Conservation
Department	Sustainability
Intent	Reduce Municipal government carbon footprint
Goal	Reduce city's carbon footprint 20 percent below 2006 baseline by 2012
Metric (Indicator)	Tons of Carbon Dioxide
Result	The City completed its first LEED-Silver facility (District Court) under the Green Building Policy requiring all new, City-owned buildings under 5,000 square feet to meet the LEED-Silver standard. Approximately $300,000 of energy efficiency upgrades were performed on seven City buildings in 1st quarter of 2009. Building Services installed the City's first elastomeric white roof following the WalMart roof specification. And the City installed its first LED trail lights as a pilot project. A carbon footprint assessment will be done in 2010.

6.3.7 Innovative government organization

Before Portland's specific sustainability indicators are discussed, it may be instructive to step back and look at the city's organizational and political structure, as Portland's unique form of governance likely has had an effect on how its SIs have been developed and utilized. Portland's government is the latest among large cities in the U.S. to be built on a Commission model (City of Portland Auditor's website, 2011). The mayor, four commissioners, and the auditor make up the six elected officials who sit on the city council (Portland Auditor, 2011). These officials enjoy administrative and quasi-judicial powers.

> *[T]he Mayor and Commissioners also serve as administrators of city departments, individually overseeing bureaus and carrying out policies approved by the Council. The assignment of departments and bureaus is determined by the Mayor and may be changed at his or her discretion. Bureau assignments do not necessarily correspond to departmental titles. (For example, the Commissioner of Public Works may not necessarily have any of the public works bureaus in his or her portfolio.)*
>
> City of Portland Auditor's website

Every organizational structure has its strengths and weaknesses; a strength of Portland's structure is that the four commissioners are directly accountable to the general public. However, a commissioner or commissioners may have a different sense of what

the public wants compared with what the mayor may want; unlike under a "strong mayor" structure, in Portland, a mayor's agenda may easily be impeded by dissention on the commission. It thus can be challenging to develop a common vision, specifically for sustainability and in developing a short list of sustainability indicators – a dashboard of indicators for the entire city government.

During the past few years, as reported in my interview with the city's senior planner, the city's Bureau of Planning and Sustainability has developed a template for all of the bureaus in the city to use in implementing sustainability principles. The senior planner also reported that this template had proved too basic and, as a result, was in the process of being revised. Once refined, the template concept may ultimately prove an effective tool for Portland's unique political and organizational structure.

6.3.8 Regular reporting

In Fayetteville, the Sustainability Goals and Metrics Report is developed in November and December of each year and then published the following January. According to a planner for the City of Fayetteville,

> *There is a certain amount of buy in from staff when they meet their goals and the report is reviewed by the City Council and Mayor. At the end of the year, we look at goals and the metrics tracking the goals and put together the annual report - some drop [programs and measures], some [programs] stay on. Special projects drop off and we seem to keep a core group of metrics year after year.*

The planner also reported that the city's sustainability efforts over the previous five years had been oriented toward the internal policies and processes of the city, but "[t]his year, we got a good handle on city goals and metrics."

Fayetteville's sustainability efforts continue to become more sophisticated. The city appears to be expanding its scope, looking outside of city government to the community as a whole and at interconnections between programs and metrics. "The low hanging fruit has been picked," said the planner. "Now, the city is starting to look at the linkages between programs and activities, taking a more holistic approach with the

sustainability program, such as miles of trail built, sidewalks paved, and how mass transit and walkability are connected."

The "low hanging fruit" for sustainability reflected by the metrics currently in use in Fayetteville include energy efficiency, new building practices, retrofitting of existing buildings, biofuel use, and paper consumption in city operations. The city is now turning to linking individual sustainability programs through actions such as developing efficient routes for city vehicles by using spatial analysis and GPS technology.

As reported by Fayetteville's planner, another example of how the city is increasingly looking beyond individual sustainability goals and indicators to their linkages can be found in the city's partnering with the University and advocacy groups to study plant diversity in order to determine which species and areas should have priority for preservation and in its attempt to connect the land-use dots, as in its ongoing effort to physically interconnect ball parks, wetlands, and viewpoints from uplands in order to design extended areas for non-motorized uses. The program intends not only to accommodate alternative modes of travel around the city but, as seems to be true for the city's sustainability efforts overall, to try to change the way development occurs in order to ensure the city's sustainability.

For the past 20 years, Portland's Office of the Auditor has published the "City of Portland, Service Efforts and Accomplishments (SEA) Report." This document may be the most comprehensive periodic performance report for city operations in the country. The SEA report is intended to provide a transparent accounting of each of the bureau's performance in terms of inputs (resources used), outputs (activity measures), and projects accomplished. The report includes narrative statements on program efficiencies and effectiveness. The SEA report is open to the public and decision makers and uses data made available by the participating bureaus. In addition to summarizing and highlighting outcomes in key service areas, the report compares results against those in previous reports (City of Portland SEA Report, 2010).

The report is unlike other city audits in several respects, including in its omission of recommendations for improving city financial processes. Rather, the report sees its

purpose as promoting the use of performance data to inform management decisions and to demonstrate some outcomes of bureau efforts (City of Portland SEA Report, 2010). The report is also intended to instigate prompt examination of any positive or negative trends that may be of interest to city officials and residents (City of Portland SEA Report, 2010). Lacking the benefit of overarching city sustainability goals, the disaggregated indicators contained in the SEA report are nevertheless very useful for measuring and monitoring sustainability progress.

6.3.9 Features common to successful SIP cities

Looking at three of the most successful sustainability cities discussed above, based on content analysis, common factors contributing to SIs actually being utilized by the city governments come to light:

Official leadership and professional support – Support and leadership from both top policy makers (elected officials) and committed and knowledgeable staff is necessary for developing and institutionalizing SIs.

Human capital – Most cities with advanced sustainability plans and SIPs happen to be cities where universities are located. An educated and engaged populace contributes to human capital.

Funding – Federal funding (economic stimulus funding) has enabled many cities to hire staff, sometimes in the form of sustainability coordinators. Considering the recent downturn in the national economy, only the very committed cities are managing to keep their sustainability indicator programs going at full steam.

Dashboards and relevant reporting – Sustainability indicators must not only be relevant but presented to decision makers and the public in an easily accessible and useable manner. Successful sustainability cities surveyed in this study have been or are moving toward dashboard reporting formats.

Diverse and emerging conceptual models – There is no one commonly agreed-to model for local sustainability programs and indicators. Several different models are being used and commonalities have begun to emerge. As more cities establish programs,

organizational structures and decision making processes and planning will become available and will contribute to the development of an increasing number of SI programs.

6.4 Summary

The three case studies discussed above show how high-ranked cities are using a variety of innovative techniques in lieu of conceptual models or standard operating procedures to develop and implement sustainability indicators.

The questionnaires supplied from the previous chapter provided one layer of information, while the telephone interviews deepened this study's findings regarding cities' priorities and decision-making processes. Examples of institutionalizing sustainability indicators are not usually easily found on a city's website or made noticeable to the public, perhaps because government processes and practices are sometimes not tangible or effectively able to engage with the public eye. Specific factors, such as energy-efficient buildings, green cars, or recycling programs, are more tangible and thus more easily reported. The survey of the 38 cities provided an effective method to confirm and focus the information gathered in and findings made as a result of the broad-based web investigation conducted of the 200 cities in the first phase of the study. Survey responses frequently contextualized, informed, and deepened my understanding of local activities. Where a city's website had provided some information, the questionnaire responses, particularly in the comments section, often told the story behind web-posted facts.

Still, a nuanced understanding of how particular cities' successful sustainability indicator projects had evolved over time and had come to fruition could not be garnered from websites and digital surveys. The phone interviews thus proved critical in eliciting stories about and details underlying ways that sustainability indicators are currently being successfully integrated into governmental decision making.

Chapter 7: Case Study—Efforts at Implementing Sustainability Indicators in Juneau, Alaska

[Juneau's SIs] seemed like a good list, but it was kind of developed in isolation without any implementation plan.

Juneau focus group member

7.1 Introduction

This chapter presents a case study of the City and Borough of Juneau, Alaska's (Juneau's) developing but yet to be operationalized sustainability indicators. Comparing findings from the two previous components of this study, as reported in chapters 4, 5, and 6, to the Juneau experience, through focus group research, this case study addresses the dissertation's third set of research questions:

- What were barriers to development and implementation of sustainability indicators in Juneau, Alaska?
- What conditions would facilitate future development and implementation of SIs in Juneau?
- How does Juneau compare with other communities' SIP experiences analyzed in this study?

7.2 Methods

The study of this chapter used a single case study design (Gerring 2007) for investigating the development of SIs in the community of Juneau, Alaska. A case study approach was selected because of the complexity of studying community behavior and decision making. Case study methods are widely recognized in many social science studies, especially when in-depth explanations of a social behavior are sought (Zainal, 2007).

As part of the case study, a cross-case analysis was conducted to compare questionnaire survey responses by the informants from 38 cities, the results of which are reported in chapter five, with responses from 21 focus group members in the Juneau case study.

The Juneau case study was designed with the findings from the preceding phases of the dissertation's research in mind. The wide breadth of the 200 cities explored in

chapter four and the 38 cities surveyed in chapter five set the stage for a more particularized and in-depth case study of a single city's experiences and also afforded opportunities for cross-case studies (Gerring, 2007). The first two research phases of the dissertation thus laid the foundation for an analysis of Juneau's situation by identifying nationwide patterns and trends in sustainability planning, implementation, and reporting, and by unpacking lessons learned by other communities that have attempted with varying degrees of success to overcome obstacles to SI implementation similar to those faced by planners in Alaska's capital city.

Multiple sources of data were used in the Juneau case study, including primary and secondary qualitative data. Three focus groups consisting of a total of 21 expert informants provided the primary data source for gathering information on and learning about the experiences of experts involved with Juneau's sustainability indicators. All of the expert focus group participants responded to the same questionnaire used for the 38 cities, allowing for a cross-study comparison of the two research samples. A benefit of using an expert focus group, as described by Krueger (1998), is that such groups elicit a variety of interactions among study participants, resulting in a more open discussion of the research topic. Secondary sources for this case study included local environmental, economic, and social information and gray literature, including government-authored reports about Juneau. My experience participating in and observing Juneau's SI efforts, as described in my personal vignette in chapter one, provided an additional source. A series of steps adapted from those presented by Morgan (1984) were used to organize and conduct the focus groups.

7.3 Context and background

Cities are complex adaptive systems (Grove, 2009). The local context for the Juneau case study provided below sets out the main ecological, social, cultural, and demographic variables that comprise Juneau's unique complexity. Results of a recent (2008) public opinion poll are also provided to give a sense of the general public's opinions on some of the main issues in the community.

7.3.1 Ecological landscape

Juneau is located in the Alexander Archipelago, along the north-central portion of the Alaska panhandle in the southeast part of the state, approximately 600 air miles southeast of Anchorage and 900 miles north of Seattle, Washington. In its most recent count, the U.S. Census Bureau put the 2010 borough population at 31,275 (U.S. Census Bureau, 2011). Juneau is accessible only by air and sea. At 3,250 square miles, the borough represents one of the largest municipalities in the United States. Bounded on the west by Lynn Canal, Juneau is backed up against mountains and glaciers to the east (*See* Figure 7.1). An extreme landscape, the borough ranges in elevation from sea level to higher than 8,200 feet (2,499 meters) in its Coast Range mountains (Sprenke et al., 1999).

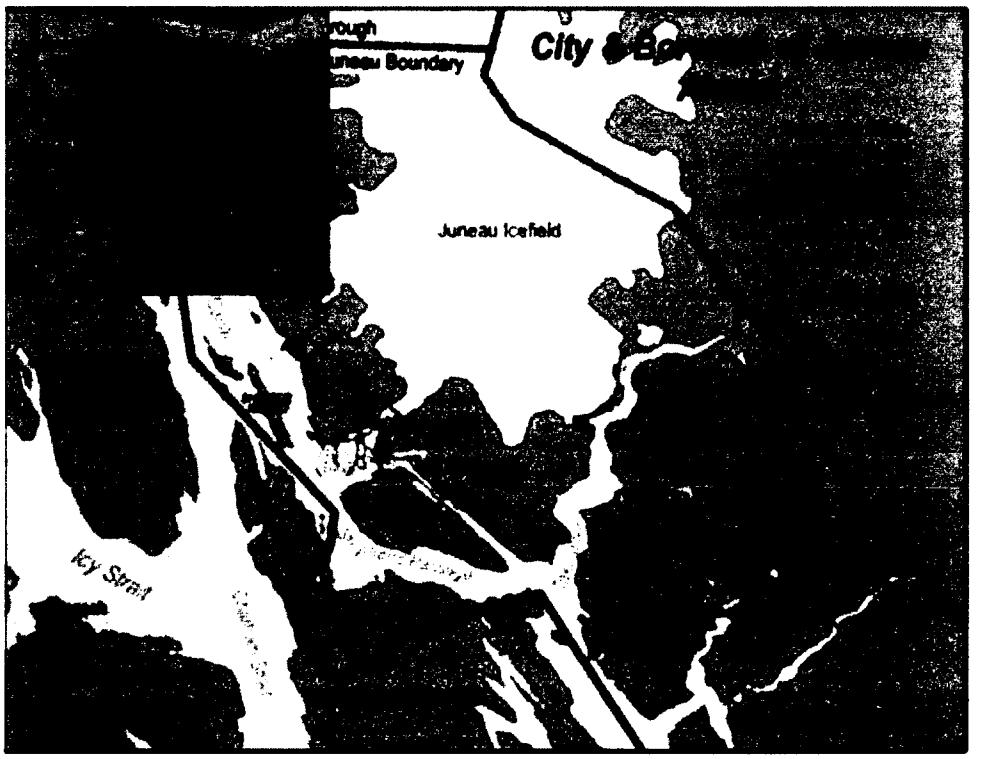

Figure 7.1. Map of the City and Borough of Juneau. The map shows the boundaries for the City and Borough of Juneau. The inset is a map of the State of Alaska with a blue star indicating Juneau's location. (Adapted from City and Borough of Juneau website, 2012)

The downtown area is made up of small, historic, walkable streets, with ample facilities and parks where residents routinely gather for numerous cultural, recreational, and educational activities. Perhaps the physical closeness and natural biophysical

features, and limited surface access, together with the city's geographic isolation, contribute to residents' strong sense of place, discussed later in this chapter.

Figure 7.2. Photograph of Downtown Juneau, Alaska. Photo of Juneau looking north with Mount Juneau in the background.

7.3.2 Social and cultural life

In 2009, Juneau's population was made up of 11% Alaskan Native, 6% Asian and 1% Pacific Islander, 1% Black, 72% White, two or more races 9%, and Other 2%. *See* Table 7.1 below (Alaska Department of Labor, 2010).

Table 7.1 Juneau Demographic Snapshot 2009. Juneau has a slightly older population and smaller African-American population than Alaska statewide. However, Juneau residents have higher income, less poverty, and are better educated than Alaska residents statewide.

2009 Population Estimates

	Juneau	Alaska
Population	30,661	692,314
Percent female	49.7%	49.0%
Median age	38.0	33.5
Age under 5	6.9%	8.4 %
Age 18+	74.9%	71.1%
Age 65+	8.4%	7.5%
White	71.7%	68.5%
Black or African-American	0.7%	3.7%
American Indian/Alaska Native	11.2%	13.5%
Asian	5.6%	4.7%
Pacific Islander	0.5%	0.6%
Some other race	1.8%	1.7%
Two other races	8.6%	7.4%

Source: U.S. Census Bureau (2009)

American Community Survey, 2005 to 2009

	Juneau	Alaska
Average household size	2.6	2.8
Average family size	3.1	3.4
Born in Alaska	40.2%	39.5%
Median household income	$76,437	$64,635
Median family income	$88,429	$75,439
Living in poverty	6.7%	9.6%
Less than ninth grade education	1.6%	3.5%
High school grad or equivalent	25.3%	28.5%
Some college, no degree	28.4%	27.8%
Associate Degree	6.1%	7.9%
Bachelor's degree	23.7%	17.1%
Graduate/professional degree	12.1%	9.5%
Veterans	15.0%	10.7%
Owner-occupied housing units	63.7%	63.8%
Median home value, owner occupied	$284.000	$221,300
Renter-occupied housing units	36.3%	36.2%

Source: U.S. Census Bureau (2009)

Notably, the median age in Juneau is 38—older than both the state and national medians of 33.5 and 36.7 respectively (Alaska Department of Labor, 2010). Juneau's population is aging, with the number of seniors more than doubling in the past 20 years—from 10 percent in 1990 to 22 percent in 2009.

Beyond the high per capita number of professionals found in any capital city, many of Juneau's citizens are well-educated, as shown on Table 7.1. Several educational and research institutions ranging from the University of Alaska Southeast to federal research centers like the Forest Service's Pacific Northwest Research Laboratory and NOAA and NMFS facilities, add to the city's rich intellectual capital. Native cultural centers like the Sealaska and Goldbelt Heritage Institutes contribute to a deep and rich indigenous culture.

7.3.3 Health

According to a 2010 study by the University of Wisconsin Population Health Institute and Robert Wood Johnson Foundation, Juneau is the healthiest community in Alaska. A large number of health factors were used to determine this ranking, including smoking, adult obesity, excessive drinking, high school graduation, unemployment, and others (cited in JEDC, 2011, at p. 31).

7.3.4 Government and economy

As the regional hub for northern southeast Alaska, the City and Borough of Juneau owns and operates many facilities and services, including an airport, hospital, ski area, and several harbors. At a little over 31,000, Juneau has the fourth largest population of any city in Alaska. Its economy is built on fishing, mining, tourism, education, health care industries, and government.

	2010	2009	% Change from 2009
Juneau Employment and Wages[1]			
Total Employment	**17,932**	**17,528**	**⬆2.3%**
Total Government Employment	7,436	7,284	⬆ 2.1%
Total Private Sector Employment	10,496	10,244	⬆ 2.5%
Total Payroll ($000)	**$790,329**	**$754,402**	**⬆4.8%**
Average Wage	**$44,074**	**$43,039**	**⬆2.4%**
Unemployment	**5.80%**	**6.10%**	**⬇ 0.3% pts**
Juneau Demographics[11]			
Population	**31,275**	**30,946**	**⬆1.1%**
Median Age	**38.1**	**38**	**⬆0.3%**
Juneau Schools			
K-12 School District Enrollment[2]	**4,968**	**4,953**	**⬆ 0.3%**
Spring University of Alaska Southeast[3] **Enrollment (Juneau campus)**	**3,067**	**2,724**	**⬆12.6%**
Child Care Capacity[4]	**575**	**583**	**⬇-1.4%**
Juneau Sector Employment[1]			
Mining[1]	**510**	**404**	**⬆ 26.2%**
Fishers and Crew (Juneau Residents)[5]	**689**	**697**	**⬇-1.1%**
Health Care[1]	**1,391**	**1,327**	**⬆ 4.8%**
Tourism[1] (see definition)	**2,162**	**2,156**	**⬆ 0.3%**
Largest Employer: State of Alaska[1]	**4,276**	**4,221**	**⬆ 1.3%**
Juneau Transportation			
Total Passenger Arrivals	**1,257,470**	**1,380,359**	**⬇-8.9%**
Cruise Passenger Arrivals[9]	875,593	1,018,700	⬇-14.0%
Alaska Airlines Passenger Arrivals[8]	267,765	257,719	⬆3.9%
Ferry Passenger Arrivals[7]	77,991	73,189	⬆6.6%
Capital City Transit (Bus) Ridership[6]	1,226,286	1,212,419	⬆1.1%

Figure 7.3 Juneau by the Numbers. [1]Alaska Department of Labor; [2]Alaska Department of Education and Early Development; [3]University of Alaska; [4]Association for the Education of Young Children – Southeast Alaska; [5]Southeast Alaska Multiple Listing Service; [6]City and Borough of Juneau; [7]Alaska Marine Highway System; [8]Juneau International Airport; [9]McDowell Group and Cruise Line Agencies of Alaska; [10]Bureau of Transportation Statistics; [11]U.S. Census, 2010. "Tourism" includes air, scenic, and sightseeing transportation, travel agencies, and Leisure and Hospitality. (Adapted from JEDC, 2011, p. 1)

As Alaska's capital city, Juneau employs 42% of all of the government workers in the 49th state—41% in state government and 15% in local government (Alaska Department of Labor, 2011). Over the past 30 years, the community has successfully overcome several attempts to move the state capital or the state legislature out of Juneau. It is generally acknowledged that losing the capital would have severe consequences for not only the local economy but for the City's identity and culture.

The cruise ship industry has emerged as a major economic driver in the area over the past thirty years. In 1990, 235,000 cruise ship borne tourists visited Juneau; by 2010, that number had increased to over 1.2 million (JEDC, 2011). The literature indicates that industrial tourism has had significant negative effects on social-ecological systems in coastal communities, with the interface between marine and terrestrial ecosystems being especially vulnerable to recreational impacts related to tourism (Mieczkowski, 1995). The rapid growth of the cruise ship industry has changed the built environment in downtown Juneau as well as dealing ubiquitous consequences for community life overall. Although cruise ship tourism has created jobs for residents (JEDC, 2011), environmental impacts, such as air pollution and water pollution, have become an issue for the community and state. Several violations of air quality regulations and wastewater discharges in excess of state water quality standards have been recorded (Alaska Department of Environmental Conservation (ADEC), 2011). A scientific panel has now been established to advise the state on environmental issues associated with the cruise ship industry (ADEC, 2011).

Some of these impacts have been mitigated, for example with the development, in 2001, of the first shore power electrical hook up, which has decreased air pollutant emissions from docked ships while increasing purchases of resident hydroelectric power that help provide for the city's emergency power needs (Alaska Cruise Association, 2011). This growing industry represents one of Juneau's central sustainability issues.

Juneau jobs pay relatively high wages, with the average government worker earning $52,238 and the average private sector worker earning $36,515 (JEDC, 2010). Although these wages appear to be healthy, the cost of living in Juneau is very high. For

example, the price of housing has increased, in spite of the national housing crisis, to an average of $313,385 for a single-family home.

7.3.5 Biennial public opinion poll

In 2008, the City commissioned the League of Women Voters of Juneau (League) to conduct a biennial public opinion poll to coincide with the City's biennial budget. At that time, the League had been conducting the poll for over 20 years. The poll, which employs a telephone survey with specific and open-ended questions, and which is statistically rigorous, has historically been used by city government and the elected officials to determine the general public's opinions on pertinent issues ranging from existing city services, to city financial management (City and Borough of Juneau website, 2012). The survey included seven categories of questions:

1 - Funding city government (increase, reduce, or maintain spending)

2 - Funding for city services
(police, parks and recreation, schools, ski area, airport, docks and harbors, libraries, and youth)

3 - City spending 10 priorities (*see* Table 7.2)

4 - High school sports and activities funding

5 - Child care

6 - Affordable housing

7 - Cruise ship docks (League of Women Voters of Juneau, 2008)

Table 7.2 CBJ 2008 Budget Survey, City Spending Priorities. The City and Borough of Juneau (CBJ) spending priorities included in the 2008 Budget Survey are listed in the far right column. Residents were asked to respond given a scale of 1 – 5, with 1 being the least important and 5 being the most important.

City Spending Priorities	**All CBJ Residents**				
Spending Priority (1 thru 5)	1	2	3	4	5
Recycling	9.1%	7.9%	22.6%	20.6%	39.8%
Airport Improvements	18.3%	21.1%	33.8%	15.5%	11.4%
North Douglas Crossing	36.3%	15.6%	16.4%	15.1	16.6%
Expanded Bus Hours & Routes	14.9%	13.1%	30.3%	25.2%	16.5%
Water/Sewer Extensions	9.8%	15.4%	37.4%	24.4%	12.9%
Solid Waste Disposal/ Land Fill	3.8%	4.3%	21.7%	30.4%	39.6%
Enhanced Trail Access and Upkeep	23.1%	22.3%	30.7%	16.0%	7.9%
Youth Programs	4.8%	8.4%	34.7%	29.4%	22.8%
Energy Efficiency	7.2%	8.2%	22.4%	23.7%	38.4%
Social Services Programs	8.5%	10.5%	34.4%	25.9%	20.8%

Source: (League of Women Voters of Juneau, 2008)

Most of the respondents to the survey responded favorably to the City's level of services and funding priorities. The public's general satisfaction with the City's budget priorities reflected general satisfaction with the City's policy direction. Specifically, 44% of the respondents reported that city government should maintain its current spending levels, with 12% - 15% favoring reductions in staff or capital projects or increases in sales tax or property taxes. Between 60% and 80% of the respondents supported maintaining or increasing funding for nine basic services. Because residents are generally satisfied with their government and because the opinion poll provides public feedback on issues surrounding city governance, it may be considered by some to provide sufficient community feedback, thereby supplanting any need for other indicators for measuring or tracking the goals established in the Comprehensive Plan, but, as became clear in this study's analysis of the successful sustainability cities reported on in chapter six, building a sustainable and resilient community requires a more complex approach than simply periodically taking the pulse of the public on general city management issues.

7.3.6 Focus on retention of state capital

Although not included in the City opinion poll, since the 1980s, retaining Juneau as the capital of Alaska continues to be the most important issue of common concern for

the community of Juneau. As stated in the Juneau Economic Development Council's *2011 Juneau and Southeast Economic Indicators*:

> The State of Alaska remains the most important source of Juneau jobs and income, accounting for a quarter of all direct local employment (4,276 annual average jobs) and 25% of total payroll. (p. 3)

Not only is keeping the state capital (e.g., legislature, governor's residence, and executive branch offices) important for local economic purposes, but Juneau's role as the capital has underpinned the community's sense of identity, historically and culturally. For each of the past three years, the City has invested at least $475,000 annually on capital retention-related project—this following many years of substantial investments in the "capital fight," since threats of moving the capital to another part of the state began in the 1980s (L. Sica, personal communication, January 9, 2012).

Table 7.3 CBJ Better Capital Account

Line Items	Fiscal Year 2010	Fiscal Year 2011	Fiscal Year 2012
Gavel to Gavel	325,000	300,000	325,000
Constituent Airfare Support	20,000	25,000	25,000
Alaska Committee	73,500	75,000	75,000
Other Expenses	56,500	100,000	75,000
Total	**475,000**	**500,000**	**500,000**

Source: L. Sica, personal communication, 1/9/2012

Because the city receives substantial employment and associated economic benefits from state jobs, the Mayor has appointed a committee to recommend long-term solutions for the local economic downturn expected to occur when statewide oil revenue begins to decrease. Considering the feedback and tracking the City opinion poll provides, other technical information collected by city staff, and the to-date successful effort to retain the capital, is Juneau taking appropriate steps to ensure its long-term resilience? Is there any real need for Juneau to operationalize its sustainability indicators? What added value would such implementation contribute?

7.4 Focus Group Research

7.4.1 Timing and physical setting

The three expert focus groups were conducted under similar conditions in the same room. The first two focus groups were held on the same day — one in the morning and one in the afternoon on November 6, 2010. The third focus group was held a week later on November 13, 2010. The physical setting was designed to provide a relaxed atmosphere in order to facilitate an open conversation (Krueger, 1998).

7.4.2 Selection of participants

The local experts were selected based on their present or past professional roles in city government or their roles as experts in city economics or health care. Each was contacted personally and asked if she or he would be willing to contribute volunteer time to complete the same questionnaire that had been delivered to the 38 cities surveyed earlier in the study and to participate in one of the focus groups. Each of the members has many years of professional experience in local government and has lived in Juneau for several years.

Many of the participants had worked together and most, if not all, were familiar with the others in their group. This familiarity appeared to allow for spontaneous and open discussion. With little need for formal introductions, most of the allotted time could be spent on addressing the topics presented. Each of the three focus groups was made up of a balance of current or former city managers, department directors, and assembly members, representatives from the Juneau Commission on Sustainability, and experts on economic or quality of life indicators.

7.4.3 Discussion prompts

Participants in each of the three expert focus groups were asked the same several questions pertaining to this dissertation's central research question: How can sustainability indicators be used in local government decision making? General questions, including questions seeking to discover why indicators published in the 1995 Comprehensive Plan had not yet been used in city operations, were presented. The questions asked of each focus group are listed in Table 7.4.

Table 7.4 List of Questions Used to Guide Focus Group Discussions. Six questions were used to guide all three focus group discussions.

1	**Should we be concerned about measuring sustainability?**
2	How, to what extent, and at what cost?
3	**How can such indicators be useful to decision makers?**
4	Why have Juneau's sustainability indicators not been effectively used? **Did the original effort not take the SIs far enough?** Where are the SIs now? Why? **What helped Juneau's SIs get as far as they did?** What were/are constraints or barriers to implementing SIs in Juneau? **Should the SI program be changed, further developed, or dropped in the future? How? Why?**
5	What are the conditions necessary for sustainability indicators to work?
6	**In a perfect world, how would you make Juneau sustainable?** **What role do you see sustainability indicators playing toward that end?**

7.4.4 Data reduction

The focus groups generated audio tapes that were transcribed into 92 pages of written text. The audio and written texts were compared for accuracy and reviewed several times in order to identify patterns and major points related to the research question. In order to analyze the audio and written text, a series of reductions were performed.

First, to trim the narrative to substantive comments related to the research question, administrative details not relevant to the research questions or concepts were deleted from the transcripts (Auerbach & Silverstein, 2003). This reduced the 92 pages by approximately half. Second, a table was created for recording the results of coded narrative text. Open coding was performed manually by visually "sweeping" through the text of participants' statements several times, selecting sentences and phrases pertinent to the research questions (Krueger, 1998), and listing them in the far right column in the table. The table consisted of three columns.

The next step of coding was to list the codes or labels (one or two words) in the middle column of the table beside the phrase or selected sentence. A third column to the far left was created that listed the theory or concept relevant to the research questions next to the relevant codes in the middle column. The far left column of the table was

produced by axial coding. Axial coding, as explained by Kruger (1998), is the process of relating codes to each other. In this case, the codes in the center column were grouped according to applicable topics and research questions and organized in one column on the left of the table. Appendix 6 is a table containing the codes chosen to summarize participants' statements and comments. A list of the 28 codes generated from the visual analysis is displayed in Table 7.5.

Table 7.5 Codes Used for Analyzing Focus Group Data. The following codes are arranged in the table for convenience of presentation; the columns and rows do not bear significance.

holistic	complexity	silo	50/50 divide	Resilience
integration	tangibility	dashboard	leadership	long term planning
continuum	feedback	Social	change	Workload
ownership	specialization	expedient	procedural	Barriers
funding	unknown	incrementalism	status quo	Performance
knowledge transfer	political support	alignment		

A list of questions drawn from the dissertation's main research questions, with some new related questions added in, were linked to the codes and direct quotes of focus group members. These questions provided an organizing strategy to impose some level of order on the large amount of data that had been reduced using coded quotes from the focus group transcripts and to link theory where appropriate with the results.

7.5 History of Juneau's Sustainability Indicator Project

In 1992, communities around the world heard the call of the United Nations Earth Summit in Rio de Janeiro to develop sustainability indicators projects (SIPs) as a way of both lending substance to amorphous definitions of sustainability and clarifying sustainability's components. A few Juneau residents who attended the Earth Summit returned with an interest in developing SIs for their community (*see* chapter one, personal vignette). As is evident from this study's review of 200 cities discussed in chapter four, SIs typical of the early post-Earth Summit SIPs established in American cities were driven either by a small group of citizens or local government or a combination of the two. Also, as can be seen from this study's review of 200 cities and questionnaire

responses from 38 of those cities, among these first efforts can be found a common inability ultimately to implement SIs once they had been drafted.

One of the capital city's first efforts that was called by the name of "sustainability" got underway in 1993 with the convening of the Juneau Sustainability Community Roundtable ("Roundtable"). As this study's research revealed, up to around this period of time, most of the community SIPs had been initiated by local, regional, or national governments outside of the United States.

The Roundtable came about on the initiative of six local residents who had begun to care a great deal about sustainability. Juneau's SI effort was similar to that found in the Sustainable Seattle project in that it was a bottom-up effort spearheaded by a nonprofit organization (Holden, 2006). In Juneau's case, it was the Roundtable under the Juneau Chamber of Commerce, and, in Seattle, it was a nonprofit organization called "Sustainable Seattle" (Holden, 2006). The Roundtable was thought up during conversations between a few interested citizens and the Executive Director of the Juneau Chamber of Commerce and discussed further at neighborhood meetings held in preparation for the periodic update of the City and Borough of Juneau's Comprehensive Plan.

Because the Roundtable applied pre-existing criteria for selecting indicators, the SI drafting process was fairly straightforward, in particular in the environmental and economic sustainability domains. Developing SIs for the social domain, however, proved more difficult for Roundtable members because of the lack of available databases and lack of social domain expertise on the roundtable. Whatever its shortcomings, after several months of meetings, the Roundtable succeeded in developing questions and a list of SIs that were later adopted as Appendix C of the City and Borough of Juneau's 1995 Comprehensive Plan. However, to date, the indicators have yet to be used in decision making or in the setting of policy (S. Montana, personal communication, June 15, 2007).

In 2006, again as part of the revision process for the CBJ Comprehensive Plan, the city held neighborhood meetings to revise the 1995 list of sustainability indicators (*see* Appendix 7). Around that time, in 2005, the city also convened a scientific panel on

climate change. Then, in 2007, the CBJ Assembly established a citizen-based group, the Juneau Commission on Sustainability. As part of the commission's stated mission, it began developing a plan for revising the draft sustainability indicators that had come out of a series of neighborhood meetings held in 2006 and 2007 (Juneau Commission on Sustainability, 2011). A copy of Juneau's draft sustainability indicators is attached as Appendix 7.

In 2008, the CBJ Assembly approved revisions to the Comprehensive Plan, including a chapter on sustainability that directed the Juneau Commission on Sustainability to develop indicators. The Revised 2008 Comprehensive Plan removed the appendix with the list of draft indicators that had accompanied the 1995 Plan.

Since 2008, following the lead of other communities around the country that have been engaged in local actions to mitigation climate change and to address other looming issues, the City and Borough of Juneau has taken several steps toward building a more sustainable community.

Table 7.6. Timeline of Juneau Sustainability Indicators Activities

1994	CBJ Comprehensive Plan includes a chapter on Sustainability and Appendix with Sustainability Indicators.(City and Borough of Juneau Comprehensive Plan, 1995)
2005	**Established a scientific panel on climate change.(JCOS, 2011)**
2007	Published its findings in a report - *Climate Change: Predicted Impacts on Juneau.* April. Committed to responding to climate change by participating in ICLEI and the Cities for Climate Protection Campaign (Serial No. 2397(b)) Mayor created the Juneau Commission on Sustainability (Serial No. 2401 am). July. (JCOS website, 2011)
2008	**City Assembly Adopts Comprehensive Plan, Resolution 2401. Directs Juneau Commission on Sustainability to develop sustainability indicators. City Assembly created a sustainability fund (Sustain Fund 2008)**
2009 (March)	City completes an initial CBJ Greenhouse Gas Emissions inventory (City and Borough of Juneau GHG Inventory, 2009)
2010 (May)	**University of Alaska Southeast report submitted to the city as a follow-up to the GHG Emissions inventory; Toward a Climate Action Plan. (Powell and Tabor, 2010)**
2011	Juneau Climate Action Plan – Public Review Draft October 2011. (City and Borough of Juneau Climate Action Plan, 2011).

This chapter presents a case study of Juneau's experiences with sustainability indicators, including the events leading up to the City's 2008 reinvigorated interest in revising the draft indicators and incorporating them into local planning. This study's earlier findings from research on surveys of and interviews with officials from other American cities engaged in formulating and deploying SIs revealed important clues as to why Juneau's SIs failed to be implemented and informed recommendations for how Juneau's current city officials and activists may now best proceed to fully incorporate sustainability indicators into local decision making.

7.6 Statistical Analyses

Two types of statistical analysis were conducted. First, a cross-case study compared the average response of the 21 individual focus group members to each survey question to individual responses of officials from the 38 cities surveyed, as reported in chapter five.

The average Juneau response was determined by coding open-ended survey responses in the same manner used to synthesize responses by officials from the other 38 cities. Survey data from the 38 cities plus the average response for Juneau was then entered into the SPSS (2010) software classification and hierarchical clustering analysis program. The cluster analysis provided a method for identifying ways in which the cities could be grouped according to their response data. These city data clusters were then compared to the study's five-tier sustainability indicator categories from chapter four to determine if the two data sets bore any relationship to one another. Basically, the cluster analysis shown in Figure 5.1 was redone with Juneau being added to the other 38 cities.

Second, 92 pages of transcripts from the three expert focus groups were analyzed manually and by using Atlas.ti to locate and code variables, annotate findings, and evaluate relationships visually (Atlas.ti, 2010). The focus group transcripts were loaded into the software along with the codes selected from the visual analysis (*see* Table 7.7).

Following comprehensive data analysis using the above-described methods, findings, including those derived from both primary and secondary information, were

summarized in narrative form. The findings served as the basis for the Discussion section that comes later in this chapter.

7.6.1 Cluster analysis of Juneau's SI activity compared to 38 cities

A graphic illustration comparing Juneau's SI experiences with the experiences of the 38 cities surveyed earlier in this study was prepared using a cluster analysis and dendrogram. The SPSS cluster analysis bundled the 39 city responses into 10 nested clusters (A – J) displayed as such on the dendrogram shown at Figure 7.4. As with the tier groupings identified in chapter four, certain rationales can be located when reviewing each city's response within each cluster. For example, most of the cities in cluster A left several questions on the questionnaire unanswered. The cities appearing at the other end of the dendrogram, nests D – J, appeared to share more characteristics, perhaps because those cities completed most of the survey with similar responses to questions about types of indicators used.

Juneau appears nested at the far bottom of the dendrogram with other cities that responded to many of the questions. Cities most unlike Juneau that appear nested toward the top of the dendrogram generally responded to fewer questions because they answered that they did not have SIs, which disqualified them from answering several questions, or because they did not answer questions for other unknown reasons. None of the cities at the top of the dendrogram responded to any of the questions about types of indicators used. This included the City of Fayetteville, which does measure sustainability and is a high-performing sustainability city; however, because its official did not respond to the question regarding the type of indicators the city uses, Fayetteville appears nested toward the top of the dendrogram.

Looking at the responses from cities located farthest from Juneau on the dendrogram in four survey areas—defining sustainability, measuring sustainability, social domains, and types of indicators—provides insight into reasons for the nests in Table 7.7.

Cities in the first cluster, Nest A, for the most part did not answer most of the questions, including questions about types of indicators, whereas, unlike most of the cities, Juneau did respond to questions about types of indicators. Perhaps Juneau respondents (average of the 21 focus group members) felt obligated to me since they were familiar or had a professional relationship with me.

Table 7.7 Top and Bottom Cities on Dendrogram and Responses to Questionnaire. Differences between the responses to four questions from the questionnaire suggest why the 10 cities at the top of the dendrogram (Fig.7.5) and 2 cities (Juneau and Newport News, CA) at the bottom of the dendrogram are positioned farthest from each other. Juneau, at the bottom of the dendrogram, answered yes to all of the four questions listed below compared to the top eight cities positioned at the top of the dendrogram that answered no to all the questions.

Cities	Four Questions from the questionnaire (responses to questions N= no Y= yes)			
	Do you define sustainability?	Does the city measure sustainability?	Is the social domain Integrated with economic & environmental issues?	What types of indicators are used?
Cities at the Top of Dendrogram				
Waterbury CT	N	N	N	N
Hoffman Est., CA	N	N	N	N
Buena Park, CA	N	N	N	N
Wayne, NJ	N	N	N	N
Bristol, CT	N	N	N	N
Encinitas, CA	N	N	N	N
Hampton, CA	N	N	N	N
Savannah, GA	Y	N	N	N
Cities at the Bottom of Dendrogram				
Juneau, AK	Y	Y	Y	Y
Newport News, CA	Y	N	Y	N

Why is the city of Newport News the farthest away or most dissimilar (other than Juneau) from first cluster cities? Looking more closely, we find that Newport News answered the question about sustainability definitions, while the other Nest A cities did not. Also, Newport News answered the question about integrating indicators positively; other Nest A cities did not. Juneau was similar to Newport News in that it has defined

sustainability and has integrated social indicators. Perhaps the biggest reason Juneau was separated from the other cities is because Juneau's responses represent an average arrived at by analyzing 21 separate responses compared with individual responses from one official in each of the other 38 cities. Using all of the responses from the 21 focus group members to arrive at an average response likely resulted in broader coverage of the 40 questions compared to the other cities, where only one individual responded.

Juneau was ranked as a Tier 3 (aggregated SIs) on the five-tier SIP development scale presented in chapter four because the city has institutionalized sustainability goals in its comprehensive plan and has drafted SIs, which it is currently revising. Of the 200 cities surveyed in this study's initial phase, 23 cities and Juneau fell into Tier 3. Considering the number of cities in Tier 4 and 5, Juneau ranks in the top 21% of the cities surveyed in this study in the U.S. for developing SIPs. Tier 3 (aggregated) cities like Juneau are at the reorganization/renewal phase of the adaptive cycle, which tracks with where Juneau is in revising its SIs. When looking for a city similarly situated with Juneau, of the cities surveyed as part of this study, Fayetteville, Arkansas, a Tier 4 city, has a similar population and has high human capital with a college as part of its community. Juneau has not operationalized its draft SIs or used them in monitoring and reporting; therefore, unlike Fayetteville, Juneau did not rank in one of the highest tiers.

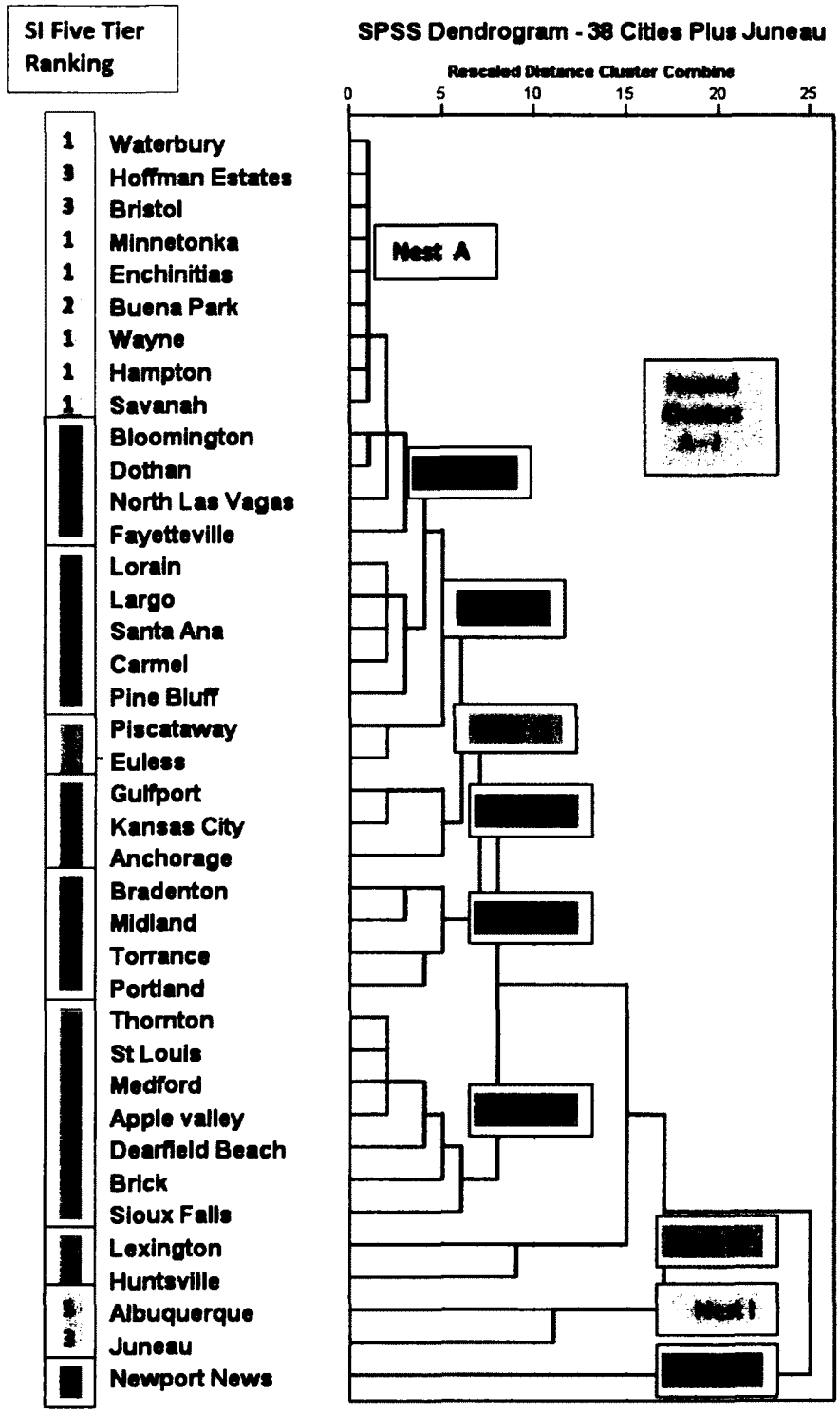

Figure 7.4 Dendrogram with SI five tiers of 38 cities, including Juneau. SPSS Dendrogram shows nested clusters A-J with SI Five Tier Ranking listed vertically next to the nested cities. No apparent relationship exists between the city ranks and the nested clusters.

7.6.2 Atlas.ti frequency analysis of focus group discussion topics

Twenty-seven codes listed in Table 7.6 and discussed earlier in the data reduction section were analyzed using Atlas.ti Code Manager software. In Table 7.8, the list of codes, frequency (number of times the code is used), and density (the number of times the code is linked to other codes. The feedback code, for example, was used once (frequency) and related to six other codes (density). The most grounded (frequency) used code is *silo*, which is linked with five other codes.

Table 7.8 Codes—Grounded (Frequency) and Density. This table displays the frequency of focus group comments by code, determined by the Atlas.ti Code Manager software's output of codes, including the grounded and density information. The "Grounded (Frequency)" column shows the number of quotations to which the code is applied. "Density" quantifies the number of times the code is linked to other codes.

Code	Grounded (Frequency)	Density (# of links)
Silo	130	5
Value	108	1
Assembly Retreat	103	3
Economic	58	1
Integrated	47	2
Definition	45	4
Public	43	3
Social	42	2
Planning	26	3
Government	26	3
Afford	25	2
Dashboard	18	3
Measureable	10	3
Centralized	6	2
Assembly	5	2
Ownership	5	3
50/50	5	1
Continuum	4	4
Green team	3	2
Compartmentalize	2	5
Isolation	2	1
Leadership	2	3
Procedural	2	3
Feedback	1	6
Resilience	1	3
Expedient	1	8

As Auerbach and Silverstein (2003) point out, recurring statements in anecdotal settings establish a foundation for theoretical narrative. The higher frequency and density codes listed in Table 7.8 (*see, e.g.,* "silo") helped to identify places in the transcripts where focus group members repeated similar ideas.

I used the Altas.ti software "Network" function to diagram networks with codes as nodes; identifying relationships between the nodes provides a way to visually decipher these relationships. The network depicted in Figure 7.5 shows the relationships between the 27 codes used in the present analysis. Three terms were used to suggest relationships between the nodes: 1) contradicts; 2) is associated with; and 3) is part of. Contradicts means there is an opposite or negative relationship; "is associated with" means there is some positive relationship; and "is part of" means there is a stronger relationship. Each of the three relationship terms was selected based on content analysis of the focus groups.

The "feedback" code has low frequency (1) in Table 7.6; however, it has the next highest density (6) of any code used, suggesting relationships with six other codes, as shown in Figure 7.6. The feedback node includes the following relationships:

contradicts	silo,
is part of	measureable,
is part of	resiliency,
is associated with	public,
is part of	integrated, and
is part of	assembly retreat.

The feedback node suggests several relationships. The value to this study of the network diagram of codes is that it allows all of the codes to be viewed together, along with their interrelationships. By viewing them together, we can better learn how terms fit in context with other codes.

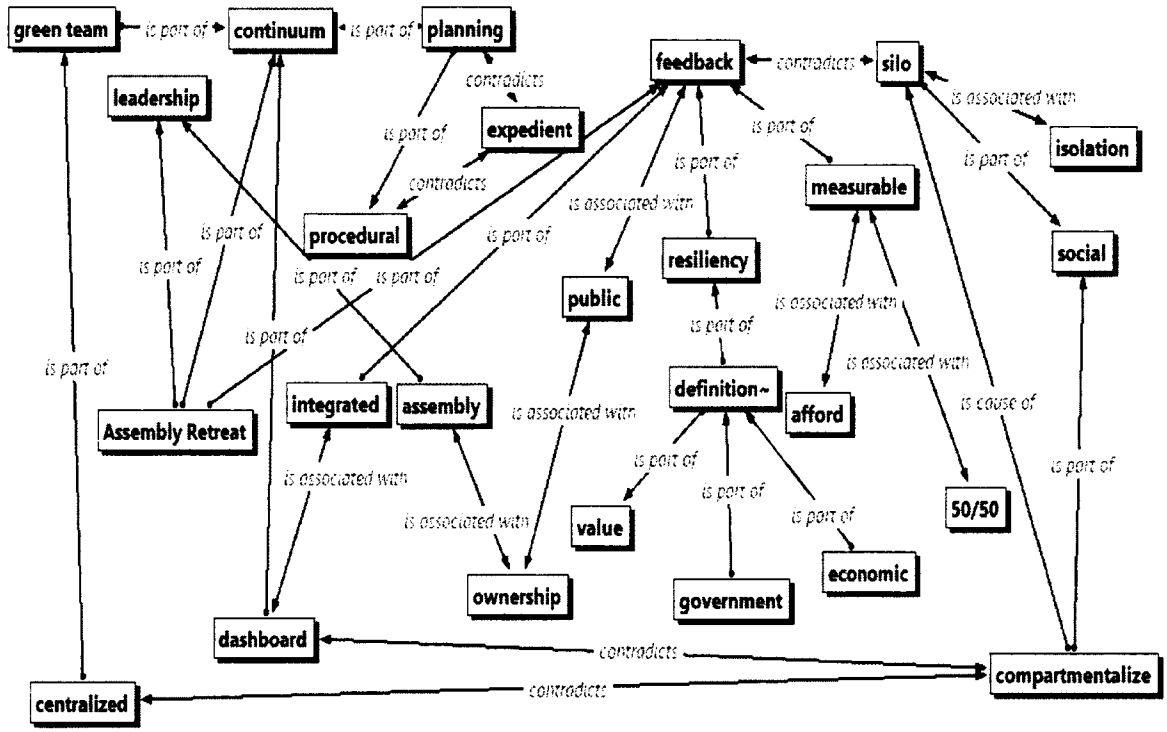

Figure 7.5 Network Diagram of Codes. Twenty-seven codes are shown as nodes in the network diagram output from Altas.ti software. The nodes are connected with arrows suggesting one of three types of relationships between the nodes: 1) is part of; 2) is associated with; or 3) contradicts. "Centralized," for example, *is part of* "green team" and *contradicts* "compartmentalize."

7.7 Summary of Focus Group Research Findings

The focus group members, who represented more than 400 years of cumulative experience in local government, provided significant insight into why Juneau's sustainability indicators have failed to be implemented for over 17 years. Participants also discussed under what conditions SIs may be made of value to decision making and implemented as part of an overall strategy for a more sustainable future. Insights gathered from the focus group members related to the topic of SIs and local decision making are presented below, categorized under 10 major topics that were identified from the relevant text of the transcripts and from the author's in-person observations of the focus groups.

7.7.1 Familiarity with sustainability definitions, concepts, and history

With the exception of two focus group members, all were comfortable with the general concept of sustainability. Many participants were familiar with the sustainability policy iterated in the CBJ Comprehensive Plan, Chapter 2, which states in part:

> [T]he CBJ Assembly committed the CBJ to a sustainable future that meets today's needs without compromising the ability of future generations to meet their needs and accepted its responsibility to:
>
> - Support a stable, diverse, and equitable economy;
> - Protect the quality of the air, water, and other natural resources;
> - Conserve native vegetation, fish and wildlife habitats, and ecosystems;
> - Minimize human impacts on ecosystems; and
> - Minimize energy usage and the release of greenhouse gases. (City and Borough of Juneau Comprehensive Plan Update, 2008)
>
> The concept of sustainability describes a condition in which human use of resources, required for the continuation of life, is in balance with nature and society's abilities to replenish them. (City and Borough of Juneau Comprehensive Plan Update, 2008).

The chapter on sustainability in the Juneau Comprehensive Plan goes on to define what is a sustainable community and explains that the comprehensive plan is infused throughout its chapters with sustainability principles. These principles are seen as providing the framework for developing Sustainability Indicators against which to measure the viability and adequacy of all Plan policies.

Survey results from the other states summarized elsewhere in the dissertation show that, of the small number of U.S. cities that define sustainability, most do so in terms of energy and environmental activities, e.g., transportation, the built environment, and energy conservation. The focus group member from the United Way felt it was not critical to have a clear definition of sustainability. Others, too, were not concerned with the exact definition. Remarked a CBJ Lands Department employee on the question of definition, "there is a component of resilience that goes along with [sustainability] — that you should be able to take a couple of hits and still be on your feet." This was the only

mention of the word "resilience" in all three focus groups. This is consistent with study findings that very few cities know of or apply resilience concepts.

Juneau's current Comprehensive Plan also includes the following new provisions related to Sustainability Indicators:

Table 7.9 Juneau Comprehensive Plan (2008) Sustainability Indicator Provisions. The table is from the 2008 City and Borough of Juneau's Sustainability Policy Section 2.3. This section directs staff to develop, implement, and monitor the effectiveness of sustainability indicators (Adapted from City and Borough of Juneau Comprehensive Plan Update, 2008).

Section	Description
Policy 2.3	"develop and use sustainability indicators to measure Juneau's progress toward becoming a more sustainable community."
Standard Operating Procedure 2.3 SOP1	Measure CBJ capital improvements, projects, ordinances, and purchases against adopted sustainability indicators to ensure that the CBJ is moving toward a sustainable future
Implementing Actions 2.3 AIA	2.3AIA1 – Support the CBJ Commission on Sustainability in completing its mission and tasks to (A) provide ongoing development of sustainability indicators and measures; (B) periodically review the indicators and measures to confirm their currency and relevance and to track the CBJ's trends; and (C) incorporate the adapted sustainability indicators into the process of scoping, funding, and carrying out all proposed CBJ Capital Improvements, including buildings, facilities, equipment, and components. 22.3.IA2 Periodically assess whether adopted sustainability indicators are measuring sustainability as intended, and amend them as necessary to improve their utility.

These newer provisions from the city's 2008 revised and adopted Comprehensive Plan provide the requisite policy direction for staff to move ahead with developing and implementing sustainability indicators, but this has yet to be done. However, the Juneau Commission on Sustainability did start the process of developing new sustainability indicators in 2010 (Juneau Commission on Sustainability website, 2011).

Only two members of the focus group commented on having difficultly defining sustainability or having an issue with defining sustainability—most likely because the city's 1995 and revised 2008 comprehensive plans already contained a definition.

7.7.2 Perceived barriers to implementing Juneau's SIs

As explained earlier, in 1993, a group of Juneau sustainability enthusiasts, under the auspices of the Juneau Chamber of Commerce, convened a roundtable on sustainability and subsequently developed the city's first list of sustainability indicators, which were later adopted by the government as Appendix C to the 1995 CBJ Comprehensive Plan (City and Borough of Juneau Comprehensive Plan, 1995). The SIs were never used by the city's agency staff or local citizens. The focus groups offered six reasons why this was the case: 1) insufficient public involvement; 2) few models for implementation; 3) tendency to want to maintain the status quo and workload concerns; 4) low sense of ownership; 5) expediency; and 6) not a leadership priority.

Insufficient public involvement

Among the expert focus group members, some of whom were city managers, planners, and directors of city agencies, none could recall using the SIs. An Assembly member commented that the "SIs seemed like a good list, but it was kind of developed in isolation without any kind of implementation plan or data collection plan." The list was developed by six members of the public and adopted as part of the 1995 Plan but did not receive government sponsorship; for example, no public notice was published for public comment. As another focus group member noted,

> *They were draft; I mean, they were done several years ago and the person who did them left and they sort of just sat there.*

Another member of the focus group commented that the SIs were

> *not very well known throughout the community . . . if you don't have public support, the indicators will not have a life of their own and go forward [beyond] the small group that has put [them] together.*

Few models for implementing SIs and developing SIPs

With only a few cities with SIs, as learned from study results reported in chapter four, there are only a few models for implementation to draw upon. The shortage of examples or models for using sustainability indicators locally was voiced as a concern and possible reason for not implementing Juneau's SIs. As one focus group member

commented, while there is a trend toward more models developing, very few were available at the time Juneau initiated its project.

> *The good news nationally is that the more cities do develop successful models for this, the more other cities can borrow from.*

Maintain status quo; workload concerns

Implementation of the SIs was viewed by several of the focus group members as likely to cause an increase in the City's workload and funding, and potentially to necessitate organizational changes. Other surveyed communities have received federal funding to fund a sustainability coordinator. Juneau has not applied for nor received outside funds for a staff position. Focus group participants acknowledged other impediments to moving beyond the status quo. A focus group member pointed out that "government everywhere is biased toward the status quo . . . to continue what we are doing." Another focus group member remarked that

> *at this point, it's just kind of the sustained level year to year to year that we try to maintain. We try not to increase the mil rate, hold taxes stable, and maintain existing services . . . we look at sustainability at the service level. Our main function areas kind of struggle with their own long term stability – chasing dollars back and forth between the programs to what you can afford and what you cannot afford... just measuring [sustainability] requires a lot of work.*

Added an Assembly member,

> *change requires work and keeping going the way we did from last year doesn't require near as much. So that to me is the biggest barrier is that it will cause us to do a lot of work.*

These statements from focus group members indicate what Folke et al. (2009) call "rigidity traps," referring to the tendency of people and institutions to resist change and persist with current management and governance systems. Efforts to begin anew to develop and implement SIs in Juneau can expect to, at least to some degree, encounter these traps.

Low sense of ownership

A lack of ownership of the first-round sustainability indicators developed in 1994 was cited by several members as one reason that the indicators lay dormant for 17 years. Only the small group that developed the list had ownership in them. Being part of the process—inviting staff, public members, experts, and decision makers into the process of developing the list—promotes ownership. This was not done with the Juneau's original SIs. A focus group member offered her perspective on why the 1994 SIs fell through the cracks:

> *Part of the problem is that nobody takes ownership [of SIs] because they go through such a broad spectrum of areas. If the city were to go through the exercise of generating sustainability indicators every year, only a small portion would be things that they could actually influence. It's the same thing with environmental indicators . . . [S]o perhaps the issue is that not one group needs to generate indicators but each area needs to find a home and a group that generates those indicators for their own purposes.*

Another focus group member agreed, adding that if you're not part of the process you're probably not going to feel much of a sense of ownership.

Expediency

Perhaps the most interesting finding arose in the focus group members' discussion on how management expediency takes precedence over procedural and planning objectives For example, one focus member commented:

> *There's a constant tension between procedural and expedient impulses. Assembly members come on and they think hey, I'm going to get something done on my time here and so that's one impulse. Then there's the planning side; there's a more procedural approach to it so there's that natural conflict. The trick is in what are you trying to sustain and what are the indicators that you're focusing on. You probably can get people on a theoretical level to agree on some of those things, but regularly they're going to want to jump ship.*

In other words, the time frame within which an Assembly member wants to get something accomplished and the time frame within which a planner thinks it should be accomplished often differ. Some in the groups thought sustainability indicators could be used to help focus people in on the most important sustainability issues and, in that way, help elected officials and city officials become more synchronized around priorities and timelines.

Not a leadership priority

The current mayor noted that "city didn't have a broad sense of sustainability (B. Botelho, personal communication, October 12, 2010). It was an add-on activity, not part of the culture." Another participant noted, regarding other pressures and limited time to exercise leadership necessary to initiate new programs,

> *I think the Assembly leadership is really key and it comes back to that sort of classic frustration of government being in reactive mode rather than leadership mode and however much you want to be more in the pro-active mode, you have to react so fast and so overwhelmingly all the time, that it's very hard to get there.*

7.7.3 Potential uses of SIs

The focus group members commented on several constructive features of sustainability indicators. Below I highlight their major points, which included how SIs could support more holistic governance through integrating program objectives, provide more tangibility, and contribute to sustainable development.

Holistic approach and integration

Focus group members expressed clear concern regarding the growing complexity of the local community and a consequent increase in the government's tendency to compartmentalize its services and planning. Below are a series of focus group member comments about the concern of compartmentalization and how SIs might be used to address the problem.

> *As a community grows, by necessity it has to compartmentalize . . . you go to small communities in Alaska . . . and they have one governing body and one*

government that controls everything. But the bigger you get, the more you compartmentalize things.

Participants suggested that SIs could be used to look at several programs issues at once.

If you're preserving one environmental value, you're probably destroying several others at the same time. You really have to look at everything simultaneously and sustainability indicators could provide this tool.

If a sustainability indicator is to be useful, then it would probably have to have an interagency dimension to it.

I think, with so many of these things, we are doing the silo kind of thing--just looking at that one indicator and whether or not it's sustainable.

Focus group participants voiced concern that horizontal alignment may be missing among the departments and vertical alignment missing among the Assembly, departments, and staff. A former City Manager noted that there "seems to be also kind of a missing link between the city organization and setting that overall goal or vision."

An interdepartmental committee called the "Green Team" was mentioned by several focus group members, including the City Planner, as the city's mechanism for "integrating sustainability practices across Juneau's city government." The Green Team, led by the Deputy City Manager, has convened several times a year to discuss implementation of sustainability across the city departments. A major point made by the Docks and Harbors Director and also an Assembly member, was that, as a threshold matter, the Assembly will need to receive training on what is in the Comprehensive Plan regarding sustainability.

One example that came up in response to this question was that during the late 1990s all social service programs were removed from direct government direction. Currently, nonprofit organizations provide the services with assistance from the hospital, which is owned by the City. Supporting a need for more holistic governance, a former Mayor reflected on the decision:

I think that [the elimination of the Social Services Department] was a real loss, because it was a dimension that was never included in the other decisions. So, we

couldn't have a real true consideration of the health, well being, economic, whatever health without that piece.

Tangibility

Focus group members voiced concerns about the need for direct and clear outcomes in order to make sustainability efforts meaningful to the general public. One remarked:

Building a more energy efficient building, [where] there are direct and clear outcomes... might not be the most efficient use of resources . . . but, once it's defined, we can go there.

Some of the focus group members commented that SIs may help close the gap by providing clarity "because we lack clear numbers and indicators that allow us to make those decisions."

Sustainable development

The struggle between maintaining a quality of life and still allowing development of local natural resources was brought up as a discussion topic by members of the focus group. Several focus group members used the term "50/50 divide," which, in government parlance, refers to a perceived even division of public opinion in the Juneau community over development issues—for example the building of a road connection to the Alaska road system or reopening a gold mine adjacent to downtown.

Another focus group member called the 50/50 divide "an ideological divide that is mushy and vague, and the middle ground sways this way and that, but it's not from lack of indicators." Some focus group members see the 50/50 divide as a positive characteristic, arguing that there should be room for healthy discussion and that Juneau's political split does not have to be divisive. Most of the participants felt implementing SIs could improve the discussion, contentious or not, by bringing forward more and better information to consider.

In the above highlighted discussions, three overall areas of concern arose repeatedly in the focus groups: growing complexity in government, the need for

tangibility when implementing sustainability indicators, and challenges inherent in planning for the very long term.

7.7.4 Focus group participants' suggestions for ensuring future SI implementation

The focus group provided a great deal of detail in their opinions about how best to develop and integrate SIs into government practices using a dashboard. Several focus group members suggested that implementation involve collaboration with United Way, which created indicators for health, and the Juneau Economic Development Council (JEDC), which publishes annual economic and social indicators. Collaboration among organizations has many benefits over developing SIs in isolation. Members also suggested exploring other data resources, such as those of state and federal agencies, the local hospital, the school district, and the University.

As discussed earlier in this chapter, the use of a dashboard was supported, as was reporting annually or more frequently. A fair amount of discussion occurred on the current shortage of feedback loops. The SIs were seen as a tool to provide improved and more types of feedback loops. The former City Engineer suggested that "we need to make a better connection between the problem and the proposed solution." Several examples of poor indicators were provided and the focus groups in general saw revising them as an opportunity to improve the indicators that the City and the general public use to make decisions. As one Assembly member noted, "there is not a lot of feedback...you're reading the tea leaves."

One point supported by several government participants was that, since it takes two to three years to integrate the indicators into the relevant systems, it may be best to start with only a few SIs, then build on their successful implementation.

Several focus group members were very positive about the possibility of developing a short list of SIs and using a dashboard to track sustainability in full view of all decision makers and the public. As expressed by one member,

> *[t]he benefit to me of a dashboard is to somebody that's outside of Juneau, because Juneau is kind of its own island, and if you haven't spent time on the island then you really don't know where we're at, regardless of whether you*

> *agree with it or not . . . I know that [the dashboard] designates some priority, just on what handful is chosen, but if we just have a handful and we integrate them into the process, we learn from those handful and then we start to build and we start to learn and we celebrate our successes and take our knocks and our stumbles accordingly.*

One Assembly member stated "[the CBJ Assembly's goals] are sort of like a dashboard. They become essentially indicators of . . . policy." Added a former City Manager, "[having] the same document in front of us makes a tremendous amount of sense." The concept of a continuum of use for operationalizing SIs was also discussed. One participant noted, "there's a continuum of how strongly you use these indicators." Acknowledging that on one end of the continuum the SIs influence every planning decision; on the other, they lie dormant in the Comprehensive Plan. The participant thought the SIs "should be systematically integrated into any policy structure."

As explained by another focus group member (a planner), any new sustainability indicators will have to be "as definitive as possible—something, a number or a dollar or something... that can be used to justify whatever action you're going to recommend." A former City Manager concurred, stating that, once the new SIs are developed, they need to be presented to staff, and staff need to be educated as to "what they are." Elected officials will need to make a "statement about how strongly these should be used," he added.

7.8 Juneau-Specific Conditions for SI Implementation

Drawing from the Juneau Case Study and the results reported in chapters four and five, the following conditions specific to Juneau's future sustainability indicator efforts are offered. A complete set of conditions for general application is presented in chapter eight in the dissertation's Conditions and Conclusions.

Based on this study's findings, the suggested way forward for successful reformulation and full implementation of Juneau's SIs would incorporate the following four actions:

1) Use existing learning networks to instill a local culture of sustainability;

2) Capitalize on residents' strong sense of place;

3) Implement SIs as a means of enhancing learning and adaptive governance; and

4) Integrate the Continuum of Community Sustainability Indicator Use.

7.8.1 Use existing learning networks

The challenges described above have provided what Kofinas (2009) refers to as "learning networks" in which citizens and decision makers have used the single and double loop learning loops, described in chapter three, to adapt. The threat of moving the state capital and the short-term energy crisis are examples of the community using learning networks necessary for overcoming the threat to the economy and energy supply.

Looking at the learning networks that were employed for addressing the impacts from the short-term energy crisis, one can see how Juneau's social capital ensures its ability to learn as a community. For example, within a few days after the town was forced to switch its power supply from hydroelectric to very expensive diesel energy, conservation by households, businesses, and government all increased drastically. The educational method used mainly involved social networking among residents about methods for reducing electrical use. The Mayor decided not to deploy the established emergency response system (Incident Command System (ICS)), instead using his personal connections to businesses, organizations, and key community experts and leaders to mount an educational campaign to conserve electricity community wide. The outcome proved the importance of social capital in terms of social networking, bridging, and bonding among and across community groups. By the time hydropower was restored, Juneau had achieved the largest percentage reduction of energy consumption by a community ever recorded, according to experts at the University of California Berkeley (Leighty & Meier, 2011). After the energy crisis, the Mayor organized a task force to evaluate the response and then implemented several of the recommendations from the task force.

This sequence of events illustrates well the idea of double loop learning in which an organization (here, a city) reflects on the consequences of past actions before taking

future action (Argyris & Schön, 1978; Argyris, 1992, cited in Kofinas, 2009). Juneau's social capital and strong sense of place have contributed greatly to the community's ability to learn and adapt.

7.8.2 Capitalize on residents' strong sense of place

While not a central focus of the research conducted in the Juneau case study, it is difficult to talk about Juneau without mentioning the "sense of place" that lies at the heart of Juneau's resilience capacity. "Sense of place" refers to the shared values and vision of a community enhanced by the development of skills in individuals and groups to effectively plan and act on collective strategies to create positive change (Chaskin, 2001). Evidence of this capacity, which is closely related to the city's significant social capital, can be found in robust citizen engagement in community affairs, a relatively high educational level, engagement in social networks, and other factors, all of which have aided the community in rebuking repeated threats to its resilience (for example moving the state capital from Juneau).

Many of the focus group members described the exceptional aesthetic and natural beauty of Juneau and emphasized that a sense of place is important. Some researchers have discussed specifically how a shared sense of place within a community can shape each of the three sustainability domains (Dale et al., 2008). Researcher Lefebvre described natural space as a vanishing commodity and thus viewed the construction of social and built space as the main shaper of place within a community (Dale et al., 2008). In the literature, researchers discuss how a sense of identity grows partly from physical place, arguing that creating communities in touch with their environment is a key precursor to sustainable community development (Brady, 2006). The interplay between space and place is especially complex, and, as discussed in earlier chapters of this dissertation, because most communities tend to silo their domains, very few cities have been able to effectively measure and track ephemeral, overarching values like sense of place.

Juneau's natural elements, including the frequent rains and long winter, together with the city's relatively compact built environment may explain why residents easily

move around in close physical proximity to one another at social and recreational events, sharing limited sidewalk space and riding together on public transit at rates higher than other cities. Downtown Juneau, where most of the residents work, is pressed up against the mountains on one side and barricaded by water on the other, making for a geographically-imposed highly compact urban space. Juneau was ranked as one of the "Ten Best Small Transit Agencies" in North America in 1999 by METRO Magazine (City and Borough of Juneau Capital Transit, 2012). According to researcher Robert Putnam (2007), contact theory suggests that diversity that has been established for a long period of time can erode the in-group/out group distinction and enhance out-group solidarity, bridging social capital and lowering ethnocentrism. Juneau is home to several ethnic groups that have been here for several generations.

Adding to the geographic isolation is the lack of road connection to an outside road system, which forces more closely proximate housing and work areas, which may be supporting the community's strong social network. The downtown business district and neighborhoods close to it are organized in a relatively linear fashion to take greatest advantage of limited flat building space, much of which is man-made of mining and other debris deposited during the first half of the 20th century.

For a city of such small population, Juneau is known for its mix of artisan and highly professional people and strong multi-ethnic roots. Juneauites have developed social outlets such as an award-winning live theater and diverse and frequent cultural and performing arts events (JEDC, 2011). The city also has an engaged citizenry, with over 35 boards and commissions through many of which residents participate directly in local government decision making (City and Borough of Juneau website, 2012). The strong sense of place inspired by Juneau's beautiful natural surroundings is augmented by the many private and public interior venues, where locals share activities and have conversations with neighbors—especially during the long winter.

The cohesiveness of the community is reflected in the civility of political campaigns and the congeniality with which local and state political leaders of diverse political parties get along. There are several examples of how the local state

representatives of different political parties network successfully. For example, the three political leaders – a Democrat State Senator, and two State Representatives, one Democrat and one Republican, regularly conduct joint community constituent meetings, introduce and recognize one other in attendance at community ceremonies, and in newsletters are portrayed as working in unison on a variety of legislative initiatives (Muñoz, 2011).

Based on my observations, a sense of civility, or some might say a forced sense of civility, persists in Juneau. I have noticed residents saying hi, greeting each other, and engaging in impromptu conversation more than in other communities I have lived in or observed. This civility may be traceable to the closed geographical quarters in which Juneau's residents coexist. People have several occasions, sometimes daily, to see each other, which creates an obligation and sense of responsibility toward one another. While possibly biased to a degree, this civility comes to mind when discussing Juneau's sense of place.

7.8.3 Implement SIs as a formal part of an adaptive governance system

Adaptive governance argues for scientific and other types of knowledge to be integrated into policies to advance the common interest in particular contexts through open decision-making structures (Brunner et al., 2005). Following the inclusion of a draft list of sustainability indicators in Juneau's 1995 Comprehensive Plan, no strategy or decision making process was laid out for implementing the SIs. Perhaps it was thought at the time that the city government would come to figure out how to use them. What proved true in this study's survey of U.S. cities proved true for Juneau as well—few cities' SIs have translated into government action. As pointed out by Juneau's mayor, Bruce Botelho, "sustainability and its indicators are not part of the culture [and] not understood" (personal communication, October 12, 2010).

7.8.4 Integrate Continuum of Community Sustainability Indicator Use

Sustainability indicators could provide an integrative tool for presenting scientific and other types of knowledge in a more attractive and easily digestible format for decision makers. Several ideas for ways in which SIs could be used in decision making in

Juneau arose in the focus group discussions. These ideas, summarized in Figure 7.6, involve implementation at generally three levels integral to city governance: policy makers, staff, and the public. All of the levels presented in Figure 7.6 could use SIs for learning by virtue of the normative (public process grounded) and scientific information that SIs provide.

Some of the focus group members mentioned that unless the SIs are discussed annually at policy meetings (Assembly retreats and other goal-setting opportunities), taken into account in budgeting (Capital Improvement Projects and operating budget processes), and presented often to the assembly, implementation will fail. Several other focus group members suggested the public should be presented the SIs at least annually. Also, there should be a mechanism for SIs to be used frequently by staff and managers.

To develop SIs that are technical enough to be meaningful yet and intuitive enough for the middle user (staff and managers) can be challenging. Sustainability indicators not only need to provide baseline data for decision making, but, more importantly, they should add value to decision making for all three major user groups – the public, policy makers, and staff.

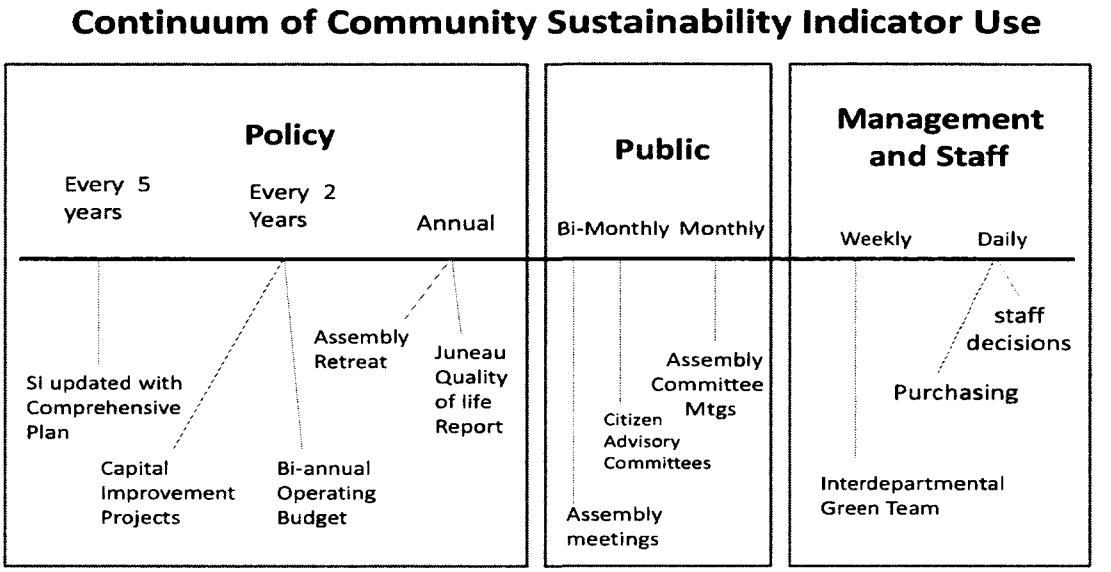

Figure 7.6 Continuum of Community Sustainability Indicator Use. Potential uses of sustainability indicators for the City and Borough of Juneau are categorized in the diagram at the policy, public, and management and staff levels along a continuum. The continuum is organized by frequency of use starting with daily use through staff decisions, monthly decisions that may involve the public (e.g., citizen advisory boards and Assembly meetings), to five-year updates of a comprehensive plan that contains policies and implementation strategies for the sustainability indicators.

7.9 Conclusion

The Juneau case study served to ground the information from earlier chapters by incorporating focus group research that collected and compared localized data in a particular setting.

It is noteworthy at the time of the writing of this dissertation, Juneau's sustainability indicator efforts from 1995 are being revitalized, backed by Policy Statements and specific Implementing Action directives in the 2008 Comprehensive Plan Update. The recent establishment of the City of Juneau Commission on Sustainability as a standing Assembly organization positions the Commission well to develop and implement sustainability indicators. The success or failure of this renewed effort will turn on whether it receives substantive and sustained support by the CBJ Assembly and

departments. The recommendations presented in this chapter may assist the JCOS in moving forward as it develops and implements new sustainability indicators. Based on the 2008 Comprehensive Plan provisions that direct SIs to be developed with implementing measures, there is ample reason to hope that new SIs will be developed and successfully implemented.

Chapter 8: Conditions for Implementing SIs and Conclusion

This final chapter offers general conditions for broad application by cities in the United States seeking to develop, implement, and maintain sustainability indicator projects and programs. A conclusion section follows the conditions.

8.1 Rational Decision Making

Many findings in this study highlight both persistent barriers to, and reasons to hope for, more rational decision making at the local level. As mentioned in the introduction and personal anecdote in chapter one, local decision makers often suffer from a shortage of information that is normatively based, integrated, and relevant for the long term. Sustainability indicators that are reviewed by and known to the public, technically and scientifically based, integrated, and that take a long view can provide decision makers both with better information with which to make ongoing decisions and with an effective tool to evaluate the results of prior decisions. Whether SIs come to play a valuable role in local governance may depend on how effectively decision makers navigate barriers, opportunities, and learning and adaptive governance.

8.1.1 Embrace intangibles, uncertainty, and bounded rationality

Several barriers presented in this study are further discussed below. These include lack of tangibility, long-term planning and uncertainty, lack of models, siloed programs, and the role of leadership. Perhaps the reason SIs and sustainability administrative processes at City Hall in the Juneau case study have not been accomplished is because, due to a complexity that makes them difficult to talk about, SIs are hard to comprehend. Add to that challenge the intricate administrative processes surrounding SI implementation, such as the measures necessary to initiate green procurement or study the linkages between programs to find better holistic solutions, and the whole endeavor can easily seem obscure to the public. To view and evaluate decision makers' success or lack of success in reaching the goals they set for the community, tangible forms, such as websites that track and report back on sustainability progress under specific SI categories can provide a means for city management to frame key issues and communicate with the general public in an easily understandable manner. Cities actively pursuing sustainability

programs use SIs and reporting mechanisms framed by their SIs, such as Internet dashboards and annual reports as means both to measure their city's progress in meeting its sustainability goals and to enfranchise community members in that progress.

The issue of tangibility raised by several focus group members in the Juneau case study relates to the concept of bounded rationality that is discussed in chapter two (Simon, 1997). The average citizen has neither the time nor resources to read about such things as complex transportation systems. A PowerPoint visual presentation on solar-powered houses, electric government automobiles, or other tangible objects can in general be quicker to communicate and easier to grasp. Because of the public's short attention span, tangible and easy-to-understand formats such as dashboards represent the most effective communications tools. Several focus group members mentioned that sustainability needs to be tangible, and not just about decision making processes—the general public needs to be able to relate to sustainability projects like recycling, energy conservation, and solar energy panels in a way that can be seen. One reason why, in the majority of the cities surveyed in this study, energy conservation projects, recycling, and other highly visible endeavors have been easier for decision makers to support is because constituents experience these measures directly and lobby in support of them. Concepts like defining, measuring, and (to a lesser extent) reporting are harder for the public to see and therefore more difficult for decision makers to support.

The concept of bounded rationality applies to tangibility and sustainability indicators in that SIs can help identify main drivers of a social-ecological system and communicate them in a much more tangible and succinct fashion. The general public and decision makers are more likely to have time to comprehend a set of sustainability indicators than to read and digest a large report on the complex issues underlying each indicator. This study's findings support the proposition that sustainability indicator projects help to address the issue of bounded rationality by providing information through condensed and strategic means such as dashboards that marry sustainability principles to public values.

A former city Public Works director from Juneau characterized as unavoidable the dynamic that as the city grows its work will continue to become more task-driven and compartmentalized. This statement aligns with Joseph Tainter's findings in his 2008 book *The Collapse of Complex Societies*, wherein he writes:

> Human history as a whole has been characterized by a seemingly inexorable trend toward higher levels of complexity, specialization, and sociopolitical control, processing of greater quantities of energy and information, formation of larger settlements, and development of more complex and capable technologies. (p.3)

Tainter goes on to point out that modern complex societies represent an anomaly in human history where for several million years humans lived in small, autonomous, self-sufficient communities. This notion of modem complexity relates directly to Simon's 1997 work on bounded rationality, which takes the limits of human capacity, including the limited ability to address complexities, as a given and recognizes that the impossibility of foreseeing the future binds rational thinking.

Another complexity affecting the actions of today's decision makers has to do with the conflating of values and science—a dynamic that tends to be exacerbated by Alaska's local government structure, where city council members normally serve in both a legislative and administrative capacity. This arrangement not only places a burden on the individual but blurs the line between values and facts, as decision making tends to roll both of these aspects of every issue into one. While not necessarily totally negative, such conflation should occur consciously if good decisions are to be made and if decision makers are to avoid arguing values against science and vice versa. In today's environment of increasing complexity, summarizing and selecting SIs that represent many subcomponents of an issue and that explore relationships among issues may lead to formulation of more efficient and integrated approaches, even as we acknowledge the limitations put on such activities by such factors as time and budgets.

8.1.2 Adaptability as key to resilience

Political scientist and economist Herbert Simon considered planning very important for maintaining rationality at a high level, arguing that planning involves

general decisions that influence future decisions by 1) limiting future possibilities by providing a strategy; and 2) guiding future decision making by placing particular values among decision-making criteria (Simon, 1997).

As pointed out in chapter two, attempts to limit future possibilities as part of a sustainability strategy run counter to several principles found not only in sustainability theory, but also in resilience theory. Resilience theory accepts and even embraces change and surprises (Folke et al., 2009), supporting the use of adaptive governance in reaction to slow and fast moving variables and thresholds. Simon's "limiting future possibilities" conflicts with resilience planning and a sustainability approach to a degree because it suggests finding some way to control the future, as opposed to acknowledging surprises and embracing the need for adaptive change. By promoting the inclusion of values as part of future decision making, however, Simon closed the gap between his approach and that of the resilience theorists. Thus, in order to address the concern raised by one Juneau focus group member—that planning must take into account that change (and often unpredictable change) will occur—decision makers in any city that endeavors to plan for a sustainable future must recognize adaptability is as, or more, important than planning. SIs can help long-term planning by providing snapshots in time as well as trend information.

8.1.3 Learn from other cities' experiences

The focus group members' discussion in the Juneau case study as to why the original list of SIs was not used by local government centered around there being no models for sustainability indicator ordinances or other "How-to's" for integrating SIs into decision making processes involving purchasing, planning, etc. While interest in green planning has been building since the late-1990s, as recently as in the first part of the 21st century, no decision-making models for sustainability had yet emerged. The general consciousness surrounding environmental issues across the country has been on the rise over the past 17 years, during which lists of sustainability indicators designed to help cities—not just Juneau, but many cities around the country—address these issues have languished in file cabinets and planning documents like Juneau's 1995 Comprehensive

Plan Appendix. Few planners or activists have understood how to connect the two realms – comprehensive planning and sustainability indicators.

Unlike the time period in which Juneau's first SIs were drafted, today other cities in the U.S. (and around the world) have begun to develop and implement SIs and SIPs, as reported in detail in this study. No longer is it necessary for each city to start from scratch—cities facing challenges analogous to Juneau's are developing integrative SI programs from which local decision makers can now learn much.

8.1.4 Implement SIs across programs to avoid compartmentalization

One consequence of increasing complexity and specialization within organizational structures is the tendency of organizations to "silo" or compartmentalize programs. To combat the acknowledged tendency of governments to segregate programs and planning and to help ensure that action takes place on sustainability issues, a few cities have established sustainability coordinator positions or an office of sustainability to coordinate activities, including the development of indicators. This innovation implicitly acknowledges that in a fractured planning environment an overarching program, which a SIP is by its nature, will most likely fall through the cracks. In the case of Juneau, the Green Team established in the office of the City Manager, has been formed to overcome silo-ing or disaggregating tendencies, even if local decision makers might not yet put the team's mission in those words. The presence of an entity like the Green Team can make the difference as to whether a city like Juneau's sustainability indicators will be integrated not only into each city program, but across all programs.

8.1.5 Bridge environmental, economic, and social domains

Sustainability indicators should include social indicators by partnering with nongovernmental organizations, which makes this objective more readily achievable. The inclusion of social indicators in the sustainability indicator development process will help to the city government in holistic evaluation of issues.

8.1.6 Step up government leadership and coordination

Without leadership, the chances that city government personnel will take the initiative and, in some cases, the risk, to apply sustainability indicators to their programs

will be very slim. In the Juneau case study, social entrepreneurs outside of city government led Juneau's sustainability movement by developing the first list of SIs, but, as a former Mayor of Juneau admitted in a focus group, city leadership failed to require their implementation. Today, however, policy makers are more frequently heard using the word "sustainability," and the general public is more familiar with the idea. Citizen interest in energy conservation and climate change has brought about frequent dialog on these issues, and sustainability inevitably finds its way into those discussions. Leadership will be needed at the top level of policy making for any city's SIs to be fully implemented, as was acknowledged in this study by a majority of focus group participants and on questionnaire responses from around the country.

In the past, perhaps the biggest factor in the non-operationalizing of Juneau's SIs was lack of Assembly involvement. Brunner, in his book on adaptive governance, discusses a leader-follower relationship in which decision makers lead in some circumstances and follow in others (2005). In the Juneau case study, considering the relatively high percentage of educated residents and the city's active populace, leaders may tend to simply follow what has been placed in motion – a comprehensive plan chapter on sustainability with specific policy directives and a Juneau Commission on Sustainability for policy and advisory assistance. However, stronger leadership will be needed in the future for government implementation of SIs and development of specific standard operating procedures.

8.1.7 Build consensus around definition of sustainability

To establish a successful local sustainability indicator program, it is essential to arrive at some kind of unified understanding of the concept of sustainability to be shared among a city's public and its government administrators and staff. The cross-study comparison in this study revealed that among the communities in the United States where SIs have been initiated by citizen groups many have been unable to garner wider support from the public or local government officials. Sustainable Seattle, for example, tends to be better known to sustainability experts outside of Seattle than among its own general populace (G. Lawrence, personal communication, October 14, 2009).

Lawrence 2009). It is clear that, without consensus around a definition, city government can develop no clear framework or policy statement to guide subsequent rules or ordinances or to provide individual new policies surrounding the development and use of SIs. In the present research, all surveyed cities that have successful SIPs have formally defined sustainability.

A major tenet of sustainability involves the importance of taking a holistic approach. Juneau and a few other cities examined in this study, including Fayetteville, Arkansas, Portland, Oregon, and Albuquerque, New Mexico, are well on their ways to integrating this sustainability principle by virtue of consistency in definitions of sustainability in planning documents such as a Comprehensive Plan. All of these cities have begun to operationalize sustainability concepts through interagency "Green Teams"—an overarching ad-hoc management team put in place to address sustainability. Some cities have established sustainability programs in their planning or public works departments and now coordinate and integrate sustainability efforts from those offices. In theory and in practice, uniting around a sustainability definition can provide the foundation for measuring and monitoring by SIPs and operationalizing SIs through ad hoc or formal programs attached to city government.

8.1.8 Conditions for effective SI development and implementation

Table 8.1 presents conditions for developing and implementing SIPS. These recommendations are based on the findings in this study.

Table 8.1 Conditions for Effective Development and Implementation of SIPs

Condition	Activity
Sustainability Indicator Program Development	
Political & Administrative Support **Sustainability Definition**	Obtain policy level (elected officials, department directors and managers) leadership and support for sustainability with measurement, monitoring, and reporting Include 3 general principles (or similar) in the definition of sustainability: a) long-term planning horizon, b) integrate social, economic, and environmental quality , c) as part of planning & public process
Distinguishing characteristics	**Include SIs that are measurable, transparent, long-term, relevant to policy objectives, measure of return on investment, updated annually or more frequently, may or may not be associated with a single domain or across domains**
Public support	• Develop with input from local experts and general public. • Reflect local values
Funding / Workload	• **Existing or new funding mechanism must be identified** • **Consider using savings realized from energy conservation programs** • **Network and partner with other organizations to leverage funding and in-kind volunteer assistance and expertise**
Sustainability Indicator Program Implementation	
Leadership and Management support	**Continue support of political leaders, department directors and managers**
Implementation plan	Establish implementation plan supported from management early in the SI development
Funding mechanism	**Identify a funding mechanism. Examples include energy efficiency program proceeds, funding outside city government.**
Integrative and systemic analysis	Integrate and use systems analysis annually for finding integrative indicators among program "silo" indicators for finding sustainability lift – efficiencies through program collaboration.
Monitoring	**Use SIs to monitor programmatic and community sustainability**
Reporting	Use dashboard, reflective of local political and managers current goals, supports annual strategic plan, budget cycle, strategic planning meeting
Organizational learning and evaluation	**Use SIs for feedback information to learn if program goals targets are achieved and if basic programmatic goals are relevant using single, double, and triple loop learning**

The most important conditions for developing and implementing SIPs included in Table 8.1 are: 1) a unified understanding and definition for sustainability that include at least three principles that must be: long-term, integrative, part of planning and public process; 2) established implementation plan developed early in the process; and 3) use of organizational learning and evaluation (feedbacks).

8.2 Conclusion

Most city experts surveyed as part of this study reported that sustainability indicators can provide a significant contribution to decision making and to local sustainability efforts, yet more than 90% of the cities surveyed don't use them. Why is that?

Establishing a suite of sustainability measures for a complex social-ecological system such as a city, with few models for how to reach nebulous and broadly defined sustainability goals, can be difficult at best. However, facing rapidly approaching threats, e.g., climate change and reductions in available fossil fuel energy resources, to name only two, some city governments highlighted in this study are applying innovative methods and establishing new procedures for addressing anticipated changes to their social-ecological systems.

8.2.1 Adaptive learning framework

Beginning with the assumption that sustainability indicators could be used as an adaptive governance tool for contributing to city resilience and sustainability, this study found a few sustainability indicator projects underway in U.S. cities. Because of the complex nature of city social-ecological systems, literature on several applicable theories and concepts, ranging from resilience and sustainability theory to adaptive governance and selected tenets of administrative theory, provided an interdisciplinary foundation from which to explore my assumption. An overarching adaptive learning framework was constructed for a city scale and displayed on a heuristic IPO model to illustrate the relationships among the various theoretical concepts, including SIs and feedback loops, and to show how information ideally flows. Indicators and feedback loops offer an approach for distilling city scale systems, illustrating how organizational, social, and

individual learning can occur. Within the heuristic framework, SIs represent a principal component when taking a systems approach to community sustainability by serving as a means for monitoring information and picking up signals of coming change.

8.2.2 Patterns of SI use and non-use

The broad proportional stratified random sample of 200 cities (N=645) used in the study provided the breadth of communities necessary for detecting several patterns of SI use/non-use among cities in the U.S. Many cities are engaged in environmental activities; however, few are developing and fewer yet have operationalized sustainability indicator projects. Most cities continue to "silo" or segregate their program indicators, including cities that have adopted sustainability indicators, the lion's share of which have not implemented their SIs in a manner that elucidates systemic relationships among programs and activities that are by their nature interconnected. Of the 200 cities surveyed, only 18 have managed to integrate sustainability indicators into governance—and, among those, only in four cities have sustainability indicators become fully operationalized.

8.2.3 Common threads and themes

The completed questionnaires and follow-up phone interviews with representatives from 38 cities provided more depth, and several themes and common threads among the cities began to emerge. Among these was a lack of integration of social programs into other aspects of city governance. According to Katie Bell (personal communication, June 17, 2010), this finding had been recognized earlier by researchers studying resilience dynamics (*see, e.g.,* Folke, 2006) and experts in social well-being. Among the denominators found to be common among all studied cities arose the importance of leadership in the development and implementation of SIs and the need for an integrated and condensed feedback mechanism, such as a dashboard of indicators, from which decision makers may easily glean the condition of the main drivers across the city's social-ecological systems. Several other major themes were identified and discussed in the dissertation's early chapters, providing data for comparison with, and to support insights gained from, the findings of the single-city case study.

8.2.4 Juneau's SIP

The Juneau case study crystallized the patterns, themes, and practices uncovered in the earlier phases of this study, from which two sets of recommendations were developed—a "Continuum of SIP Use" and "Conditions for effective SIP Implementation." Lessons learned from other cities combined with the Juneau focus group results to provide much of the content contained in these recommendations. Two sets of recommendations came out of this study. One specifically targets Juneau's renewed efforts to develop SIs and implement a robust SIP, and the other is designed to aide other cities in the U.S. in formulating successful SIs and building effective government-sponsored sustainability programs.

Compared with other of the nation's cities that have initiated sustainability indicator projects, Juneau, having in the past prepared and adopted sustainability indicators, is fairly well positioned to deploy an effective sustainability indicator program; however, local decision makers have far to go to update and operationalize the city's indicators. The fact that Juneau has created a list in the past and is in the process of developing a revised list puts Alaska's capital city in the top 10 percent of communities surveyed in this study when it comes to developing a local sustainability program.

8.2.5 Opportunities for future international research on SIPs

This study was confined to cities in the United States. However, during the literature review and based on discussions about my research with local officials from Sweden, Finland, and China over the years, it is clear that cities outside the U.S. possess insights and experiences that could benefit sustainability efforts by U.S. cities. A sampling of literature about SIPs in other countries suggests that many have developed and successfully operationalized their sustainability indicator programs. Therefore, looking at cities in China and in Scandinavia and elsewhere in Europe may uncover important clues as to how U.S. cities might more successfully advance local sustainability efforts.

Comparing and contrasting methods of local governance, both within the U.S. and globally, may provide insights into different adaptive learning models that could prove

valuable in addressing ever more rapidly changing and increasingly complex social-ecological systems.

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Appendix 1. UAF Internal Review Board Letter of Approval for Research

UAF
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Institutional Review Board

909 N Koyukuk Dr. Suite 212, P.O. Box 757270, Fairbanks, Alaska 99775-7270

June 2, 2010

To: Gary Kofinas, PhD
Principal Investigator

From: University of Alaska Fairbanks IRB

Re: [171494-2] Community Sustainability Indicators and their implications to decision makers.

Thank you for submitting the New Project referenced below. The submission was handled by Exempt Review. The Office of Research Integrity has determined that the proposed research qualifies for exemption from the requirements of 45 CFR 46. This exemption does not waive the researchers' responsibility to adhere to basic ethical principles for the responsible conduct of research and discipline specific professional standards.

Title:	Community Sustainability Indicators and their implications to decision makers.
Received:	June 1, 2010
Exemption Category:	2
Effective Date:	June 2, 2010

This action is included on the June 25, 2010 IRB Agenda.

Prior to making substantive changes to the scope of research, research tools, or personnel involved on the project, please contact the Office of Research Integrity to determine whether or not additional review is required. Additional review is not required for small editorial changes to improve the clarity or readability of the research tools or other documents.

Appendix 2. NRDC's Smarter Cities Ranking Criteria

	Criteria Details
1. Air Quality	US EPA Air Data: median AQI (7 points) Americans for Nonsmoker's Rights: 100% smoke-free workplaces (1 point), 100% smoke-free restaurants (1 point), 100% smoke-free workplaces (1 point)
2. Energy Production and Conservation	US DOE Green Power Network & Survey: Top 3 fuels used for power generation (6 points) Survey: Energy conservation incentives offered (2 points), green power offered by utility (2 points)
3. Environmental Standards and Participation	Survey: Number of city department that have environmental standards incorporated into their policies (7 points) provision of environmental commissions on which citizens may served (3 points)
4. Green Building	USGBC LEED Project Directory: Number of total LEED-certified buildings (4 points) and any number of LEED-platinum buildings (1 point) EPA Energy Star: Any number of Energy Star-rated buildings (2 points) Survey: Use of an alternative green building certification system (1 point); sprawl reduction strategies (2 points)
5. Green Space	Survey: Total number of different types of green space, including athletic fields, city parks, community gardens, public gardens, trail systems, waterfront and other (6.5 points); presence of an integrated pest management plan (1 point) Survey and Research on web sites: percentage of land that is green space (2.5 points)
6. Recycling	Survey: Total items included in recycling program (3 points); total items picked up by recycling program (3 points); public recycling bins (1 point); percentage of waste diverted from landfill (2 points) EPA Municipal Solid Waste State Data and Earth 911 were consulted on occasion to check survey responses.
7. Standard of Living	US Census Bureau: Percentage of owner-occupied housing (2 points); families living below the poverty line (2 points); median household income (2 points) National Association of Home Builders: Housing Opportunity Index (4 points)
8. Transportation	Survey: Number of green commuting options for citizens including bicycle paths, bike sharing, bus system, carpool lanes, car sharing, dedicated bicycle lanes, light rail, park and ride, sidewalks and trails, subway, trolley and other (8 points) American Public Transportation Association: documented ridership for public transportation (2 points)
9. Water Quality and Conservation	US EPA Safe Drinking Water Information System: Health-based violations (3 points); reporting-based violations (3 points) Survey: Water-conservation incentives including rebates, tax credits, conservation pricing and other (4 points)

Appendix 3. Coding of 38 Cities and Juneau Focus Groups

Combined Survey Responses

Question #2 What are the key sustainability issues?
1= climate change
2= multimodal transit infrastructure
3= managing growth, land use, open space
4= economy
5= lack of sustainability planning and consensus
6= sprawl
8= adequate housing
9= green building
10=funding for sustainable development
11= green building
12 = use of historic building
13=water quality and quantity
14= GHG
15= social equity
18= sea level raising
19= solid waste management
20 = natural resource protection

Question #3 Has your city defined sustainability?
1= on definition
2= planning
3= dissagregate
4=full program

Question 22. a) Influential Entities (Government)
1= political
2= community. dev.
3= public works
4=general services
5= transit
6= finance
8= office of sustain, planning
9=health
10= building
11=solid waste
12= training
13=engineering
14= parks and rec

Question #4 Types of Measure
1= no holistic measuring system
2= disaggregated measurement
3= scheduled to measure
Queston # 4a Different Terms for SIs
1= no relationship
2= no single term
3 = ecological ft. print
Question # 8. Other organizations
1= university
Question # 9. Holistic
1=energy codes
2=use in all conditions
Question # 16. One office
1=dispersed
2= sustain office public wk/plan
3= housing office
4= energy codes
5= sustain office overarching response
Quesition #17. Useful in Govt
1= unerelated ans.
2= performance
3= comm. Tool

Question 22. b, c, d Influential Entities (NGO, business, person, tilte, position)
1= many
2= green bldg NGO
3= environmental
4= economic
5= sustainability NGO
e) other
1= country
2= many
3= students
4= city employees

Question #26 Data Source	**Question #27 Presented to Public**
1= newspaper	1= newspaper
2= industry associations	2= on demand
3=town hall TV meetings	3= deveopment approvals
4= presentation to city	4= new comm.
	5= city council agendas
Question # 28 Funding	**Question # 31 Social, Economic Indicators**
2=always an issue	1 = unemployment
	2 = gaming revenues
	3 = business profits
Question #30 Social Integration	4= businesses opening
1 = general non specific integration	5 = tax revenue
2 = collaboration with Social NGOs	6= property value
3 = low income and energy efficiency	7= area median income
4= eldely & home repair	8 = high household income
5= transport for seniors	9 = home construction
6= water & food production	10 = housing conditions
7= health Impact Assess.	11 = empty storefronts
8= looking at overlay zoning w/ sustainability	12 = change in commercial sq ft
9= environmental justice	13 = number of residential units with designated activity centers
10=have several human health. dev. indicators	14 = mixed use corridors and major employment centers measured over time
	15 = poverty
	16 = sales tax revenue
	17 = rate of foreclosure
	18 = availability of hourly wage jobs
	19 = retail sales
	20 = property tax
	21 = affordable housing
	22 = number of commercial sites redev. Into mixed use corridors
	23 = job generation
	24 = vacancy rate
	25 = home sales
	24 = vacancy rate
	25 = home sales

Question #32 Environ. Indicators	Question #33 Social & Cultural Indicators
1 = level of maintenance	1= # of social and cultural orgs
2= crime rate	2 = diversity of population
3= water quality	3 = community involvement
4= bike trails	4 = # of cultural activities
5= % green space	5 = high School graduation rate
5= park system	6 = maintaining big lot sizes
6= air quality	7 = central bus district conditions
7 = preserving night sky	8 = neighbor complaints
8= clean streets	9 = support of arts and culture
9 = flooding	10 = unemployment rate
10= climate change	11 = affordable housing
11= # waste water complaints	12 = # of cultural facilities
12= ocean water standards	13 = improvement in ed. attainment rants
13 = open space	14 = level of service
14 = recycling	15 = success of health care
15 = ave. vehicle mi. traveled	16 = maintaining equestrian lifestyle
16 = preserve rural atmosphere	17 =available nightlife
17 = unkempt yards and properties	18 =police incidents
18= storm water	19 =neighborhood planning and activities
19 = litter	20 = support of schools and education
20 = tree canopy	21 = arts and economy
21 = remediation of contaminated soil	22 = arts funding
22 = congestion	23 = greater choice in home efficient
23 = riparian area and streams	24 = growth in hotel and restaurant bus

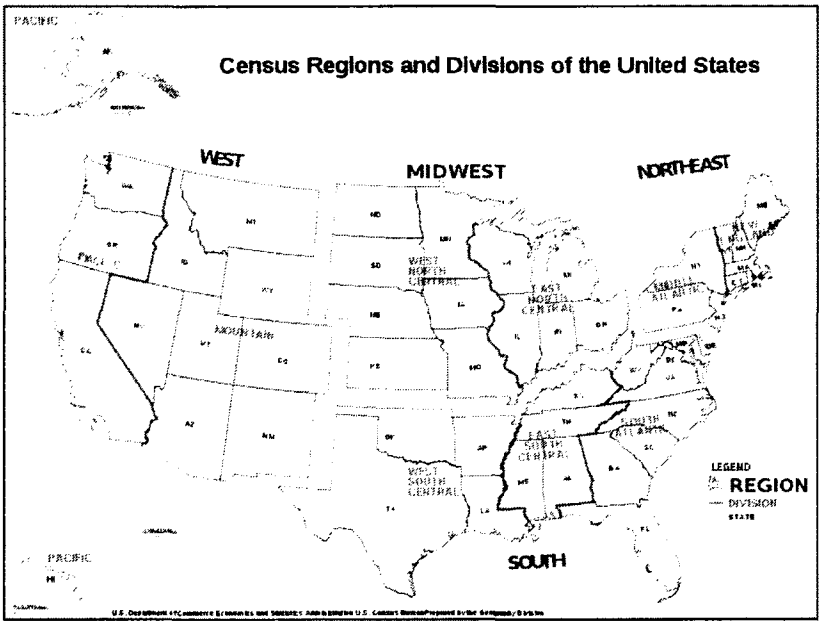
Question #34 Technology Indicators	Question #35 Public Policy
1 = opportunity	1 = political will
2 = city laws	2 = new city laws
3 = future use and long term viability	3 = growth & dev. of green industry
4 = encourage green bldg, housing	4 = policy changes in long tern land use plans
5 = city requirements of tech.	5 = public demand
6 = fundability	6 = education
7 = educational awareness	7= funding
8 = having mixed use	8= historic preservation
9 = zoning	9= use existing utilities and buildings.
10= green jobs	10= mayoral vision
11 = in city projects	11 = GHG
12 = purchasing of fuel efficient cars	12 = renewable e
13 = tech. difficulty for permit reviews	13 = crime
14 = climate change	14= public opinion
15 = adopt international b. code	15 = media
16 = internet	16 = recognized national ranking
17 =energy conservation code	17 = fact sheets for elected official on how an action support sustainability
18 = drainage	18 = policy
19 = retention	19 = cost benefit
20 = non auto transportation	20 = recycling
	21 = air and water quality
	22 = open space

Question #36 Climate Change	**Question #37 Carbon Footprint**
1 = climate change does not exist	1 = in planning stage
2= planning on strategy nothing in place yet	2 = done / emissions inventory
3= several initiatives not part of sustainability	3 = implemented
4= several initiative part of sustainability	
Question # 39 Conservation	**Question #40 Reasons to leave**
1 = no comprehensive policy	1 = education is a challenge
2 = energy efficient policies	2 = taxes and housing forced retirees to leave
3= certification program (for ex. LEED)	3 = planning to do s plan
4 = cap	4 = desire more urban NOT suburban
	5 = energy efficiency and conservation initiatives, but no indicators
	6 = economic reasons for leaving
	7 = need more explanation to ans. questions
	8 = oil dependence is a good thing - oil producing dependent economy
	9 = people leave community due to housing
	10= sustainability planning to be done in future
	11 = incentives based green bldg program

Appendix 4. List of 200 Stratified Random Cities by Region

West	South	Northeast	Midwest
Portland, OR	Austin, TX	Boston, MA	Kansas City, MO
San Diego, CA	Dallas, TX	Pittsburgh, PA	Springfield, IL
Phoenix, AZ	Louisville, KY	Islipi, NY	Sioux Falls, SD
Las Vegas, NV	El Paso, TX	New Haven, CT	Peoria, IL
Albuquerque, NM	Ft. Worth, TX	Lowell, MA	Lansing, MI
Santa Ana, CA	St. Louis. MO	Allentown, PA	Rockville, IL
Anchorage, AK	Virgina Beach, VA	Waterbury, CT	Sterling Hts MI
Fort Collins, CO	Jacksonville, FL	Syracuse, NY	Livonia, MI
Stockton, CA	Tulsa, OK	Erie, PA	Flint, MI
Santa Clara, CA	Lexington, KY	Norwalk, CT	Burnsville, MN
Bellevue, WA	Huntsville, AL	Nashua, NH	Hoffman Estates, IL
N. Las Vegas, NV	Laredo, TX	Union Twnship.,NJ	Champaign, IL
Sunnyvale, CA	Athens, GA	Fall River, MA	Terre Haute, IN
Pasadena, CA	Savannah, GA	Danbury, CT	Bloomington, IL
Pueblo, CO	Carrolton, TX	Wayne, NJ	Appleton, WI
Simi Valley, CA	Wichita Falls, TX	Brockton, MA	Eden Prairie, MN
Torrance, CA	Clearwater, FL	Quincy, MA	Decatur, IL
Fremont, CA	Richmond, VA	Framingham, MA	Olathe, KS
Lancaster, CA	Lafayette LA	Medford, MA	Minnetonka, MN
Independence, MO	Newport News, VA	Scranton, PA	Rochester, MN
Daly City, CA	McAllen, TX	Camden, CT	Troy, MI
Downey ,CA	Columbia, SC	New Rochelle, NY	Lafayette, IN
Thornton, CO	Winston/Sal., NC	Old Bridge, NJ	Saginaw, MI
Hollywood, CA	Garland, TX	Malden, MA	Palatine, IL
Pomona, CA	Pasadena, TX	Weymouth, MA	Carmel, IN
Inglewood, CA	Hialeah, FL	Milford, CT	Dearborn, MI
Bellingham, WA	Hampton,VA	West Hartford, CT	Mount Prospect IL
Mission Viejo, CA	Fayetteville, AR	Piscataway, NJ	Springfield, OH
Beaverton, OR	Denton, TX	Wineland, NJ	Lorain, OH
Shoreline, WA	Deerfield Beach, FL	Bristol, CT	Southfield, MI
San Mateo, CA	Lynchburg, VA	New Britain, CT	Southfield, MI
Westminster, CA	Lakeland, FL	West Hartford, CT	Berwyn, IL
Maui , HI	Port St. Lucie, FL	Upper Darby, PA	Lakewood, OH
El Cajon, CA	Midland, TX		Elkhart, IN
Boulder, CO	Sugar Land, TX		Bloomington, IN
Fairfield, CA	Bradenton, FL		Royal Oak, MI
Billings, MT	Bowie, MD		Hammond, IN
Medford, OR	Decatur, AL		Pontiac, MI
Flagstaff, AZ	Baytown, TX		
Ogden, UT	Plantation, FL		
Redding, CA	Daytona Beach, FL		
Carlsbad, CA	Sunrise, FL		
Longmont, CO	Johnson City, TN		
Milpitas, CA	High Point, NC		

Great Falls, MT	Boynton Beach, FL		
Renton, WA	Tuscaloosa, AL		
Arcadia, CA	Dothan, AL		
Yorba Linda, CA	Margate, FL		
Missoula, MT	Fort Smith, AR		
Kent, WA	Brick, NJ		
Cerritos, CA	Longview, TX		
Vista, CA	Flower Mound, TX		
Carson City, NV	Lawton, OK		
Apple Valley, CA	Gulfport, MS		
Hesperia, CA	Killeen, TX		
San Rafael, CA	Euless, TX		
Buena Park, CA	Midwest City, OK		
Montebello, CA	Bryan, TX		
Encinitas, CA	North Miami, FL		
Richmond, CA	Largo, FL		
National City, CA	Kenner, LA		
	Hoover, AL		
	Jonesboro, AR		
	Norman, OK		
	Pine Bluff, AR		



Appendix 5. Questionnaire

Community Sustainability Indicators Research Online Questionnaire

Greetings. Thank you for agreeing to fill out this survey. The survey is part of my Ph.D. research and dissertation work about sustainability indicators and how they shape local decision making. Your participation is critical to my study. This questionnaire and information you provide will be kept confidential – nothing you say will be connected to your name. When I am finished with the project I will send you a summary of the findings of my study and will also make my dissertation available on the web. Your participation in the interview is completely voluntary and you can elect not to answer specific questions. The questionnaire will take less than 20 minutes of your time.

Please contact me at 907-465-5185 or 209-5676 (cell) or send an email to: jepowell@alaska.edu if you have questions or comments.

Sincerely, Jim Powell

In order to progress through this survey, please use the following navigation buttons:

Click the Next button to continue to the next page.

Click the Previous button to return to the previous page.

Click the Exit the Survey Early button if you need to exit the survey.

Click the Submit button to submit your survey.

Introduction

1. How much of your job deals with issues of community sustainability?

2. What is the key sustainability issue facing your community?

3. Has your city defined sustainability?

- [ ] no
- [ ] yes

If yes, please include your city's definition of sustainability.

4. Does your city or organization measure sustainability?

- ◯ No
- ◯ Yes

If not, please describe why below.

Terms and Development

1. Does your city or organization use the term "sustainability indicators" or a different term?

- ☐ we use the term "sustainability indicators"
- ☐ we use the term "resiliency indicators"
- ☐ we used the term "quality of life"

If a different term is used for sustainability indicators, please provide below:

2. How important do you perceive sustainability indicators to enhancing community sustainability?

- ◯ unimportant
- ◯ little importance
- ◯ moderately important
- ◯ important
- ◯ very important

3. Please indicate below how important each of the entities listed below were used to develop the city's sustainability indicators.

	unimportant	little importance	moderately important	important	very important
contractor/consultant	☐	☐	☐	☐	☐
public workshops/surveys	☐	☐	☐	☐	☐
internet	☐	☐	☐	☐	☐
your city government	☐	☐	☐	☐	☐
other cities	☐	☐	☐	☐	☐
other government sources	☐	☐	☐	☐	☐
nongovernmental organization	☐	☐	☐	☐	☐
other	☐	☐	☐	☐	☐

Please name the other entities used if applicable.

Holistic measurement

1. Are the different city indicators (e.g. social, economic and environmental) applied in an holistic and interdependent fashion?

- ◯ no
- ◯ yes

2. If the city applies an holistic approach using multiple indicators (e.g. social, economic and environmental), please indicate how they are applied below:

- ☐ daily decisions at the staff and management level
- ☐ local legislation or ordinances
- ☐ operating budget process
- ☐ planning
- ☐ capital budget process

Other (please specify)

Barriers to Developing Sustainability Indicators

1. Are there barriers to using sustainability indicators in decision making?

◯ yes

◯ no

2. Please indicate how much of a barrier each of the following factors were to SELECTING sustainability indicators by using the drop down boxes.

	Fiscal	Political	Organizational	Policy
Factors				

Other (please specify)

3. Please indicate how much of a barrier each of the following factors are to IMPLEMENTING sustainability indicators in city programs and procedures by using drop down boxes?

	Fiscal	Political	Organizational	Policy
Factors				

Sustainability Data

1. What are the sources of sustainability data in your city? Please select those that apply.

- [ ] local data bases
- [ ] other communities
- [ ] existing state data bases
- [ ] national data bases
- [ ] international data bases

Other (please specify)

2. How frequently is sustainability data updated in your city?

- ◯ not updated
- ◯ once every 5 years
- ◯ once every 4-2 years
- ◯ annually
- ◯ more frequently than annually

3. Are sustainability data considered in community decision-making processes?

- ◯ no
- ◯ yes

City Decision Making

1. Does the city use one main office to address sustainability?

- ◯ no
- ◯ yes

If more than one office, please list the offices.

2. Do you perceive that sustainability indicators are useful in city governance?

- ◯ No
- ◯ Yes

Please describe why or why not in the space below.

3. How important are sustainability indicators to the following city decision-making processes?

	unimportant	little importance	moderately important	important	very important
land use planning	☐	☐	☐	☐	☐
budget	☐	☐	☐	☐	☐
human health and social services	☐	☐	☐	☐	☐
transportation	☐	☐	☐	☐	☐
parks and recreation	☐	☐	☐	☐	☐
environmental health (air,water,solid waste)	☐	☐	☐	☐	☐
energy conservation	☐	☐	☐	☐	☐

4. How does the city evaluate its sustainability indicators?

- ☐ no evaluation process in place
- ☐ resident feedback (surveys, public meetings, other)
- ☐ private contracts to evaluate the sustainability indicator programs
- ☐ an organization other than the city evaluates the program
- ☐ city conducts an internal review of sustainability indicators

5. Indicate your level of agreement with the following statement:

Local leaders support sustainability indicator initiatives in my city.

- ◯ strongly disagree
- ◯ disagree
- ◯ somewhat agree
- ◯ agree
- ◯ strongly agree

Beyond City Government

1. How important are sustainability indicators in family or individual resident decision making processes?

- ◯ unimportant
- ◯ little importance
- ◯ moderately important
- ◯ important
- ◯ very important

2. Please name the entities that were influential in the city's sustainability indicators efforts.

city department	
nonprofit rrganization	
business	
person (title or position)	
other	

3. How important are sustainability indicators in private sector decision-making processes?

- ◯ unimportant
- ◯ little importance
- ◯ moderately important
- ◯ important
- ◯ very important

4. How important are sustainability indicators in nonprofit organization decision-making processes?

- ◯ unimportant
- ◯ little importance
- ◯ moderately important
- ◯ important
- ◯ very important

Public Participation

1. When your city developed sustainability indicators, how important was public participation?

- ◯ not important
- ◯ somewhat important
- ◯ moderately important
- ◯ important
- ◯ very important
- ◯ don't know

2. How are sustainability data communicated to the public?

- ☐ not communicated
- ☐ separate government report announced to the public
- ☐ part of a budget document
- ☐ internal government report
- ☐ nongovernmental report
- ☐ internet / social networking sites

Other (please specify)

3. How are sustainability findings and information presented to decision makers?

- ☐ annual report (e.g. quality of life report)
- ☐ budget documents
- ☐ through the news media
- ☐ internet (social internet sites)

Other (please specify)

Funding

1. Please rank the following 1 – 8 (8 meaning highest level) to show the level of funding from each source for funding sustainability indicators.

	1	2	3	4	5	6	7	8
state	◯	◯	◯	◯	◯	◯	◯	◯
local taxes	◯	◯	◯	◯	◯	◯	◯	◯
local city enterprise funds	◯	◯	◯	◯	◯	◯	◯	◯
federal	◯	◯	◯	◯	◯	◯	◯	◯
nonprofit organization	◯	◯	◯	◯	◯	◯	◯	◯
volunteer in-kind services	◯	◯	◯	◯	◯	◯	◯	◯
corporate	◯	◯	◯	◯	◯	◯	◯	◯
other	◯	◯	◯	◯	◯	◯	◯	◯

Please name the other sources if applicable.

2. Please indicate which statement is correct regarding funding for sustainability indicators? Please indicate more than one if applicable.

- ◯ funding is not an issue
- ◯ funding is an issue in developing sustainability indicators
- ◯ funding is an issue with implementing sustainability indicators
- ◯ funding is an issue with updating sustainability indicators

Other, please explain below.

Types of Indicators

1. Are SOCIAL or well being indicators integrated with economic and environmental decision-making?

◯ no

◯ yes

If yes, please explain below.

2. What are the top two indicators of the condition of your community's ECONOMY (within city limits)?

1

2

3. What are the top two indicators of the condition of your community's ENVIRONMENT (within the city limits)?

1

2

4. What are the top two indicators of the condition of your community's SOCIAL AND CULTURAL QUALITY OF LIFE (within the city limits)?

1

2

5. What are the top two indicators for applying sustainable TECHNOLOGY AND GREEN BUILDING?

1

2

6. What are the top two indicators for directing PUBLIC POLICY relative to sustainability?

1

2

Related Questions

1. Please select below all the applicable statements about climate change:

- ◯ climate change is NOT being addressed by the city
- ◯ climate change IS being addressed by one program at the city
- ◯ climate change IS part of the city's sustainability program
- ◯ climate change is part of the city's sustainability indicators program
- ◯ other

If other, please explain.

2. Does your city calculate its carbon foot print?

- ◯ no
- ◯ yes

If yes, describe where the information is available below (online, city hall):

3. Please select the statement(s) about energy conservation programs that apply.

- ◯ the city DOES NOT have an energy conservation program or policy
- ◯ the city HAS a green buildings program and adopted LEED standards.
- ◯ the city HAS an alternative energy program
- ◯ as part of a sustainability program, the city HAS a green buildings program and adapted USGB LEED standards (or similar) and alternative energy program.
- ◯ as part of a sustainability indicators program, the city HAS a green buildings program and adapted USGB LEED standards program and alternative energy program.

If other, please explain below.

4. Why do you think residents leave your community? Select all that apply.

- [ ] job opportunity
- [ ] personal safety or crime
- [ ] environmental degradation
- [ ] family reasons
- [ ] climate/ weather
- [ ] social reasons
- [ ] better culture or arts
- [ ] health care

Other (please specify)

5. Is there anything else you would like to add?

Appendix 6. Focus Group Transcript Codes

Themes/ Category	Codes / Labels	Focus Group Member Quotes (Source: transcripts)
1) Sustainability definition Systems Approach	Importance of SIs & Sustainability Program	• A clear definition of sustainability is not all that critical.
	Resilience	• There is a component of resilience that goes along with it; you should be able to take a couple of hits and still be on your feet.
	Characteristics	• Realistically, [Juneau] is not very sustainable, other than hydropower. • [SIs] are inescapably value laden. CBJ added governmental to sustainability definition.
2) Concept of Sustainability Indicators	Intuitive and Transparent	• Make them simple and easy for people to grasp and valuable for decision making. Open it up for public comment then measure them over time. For me, it's about telling a story; providing the basis for wise decision making and coming up with indicators that the population can feel and see. • [SIs] should be something evident and real to the everyday person.
	Measurable	• You have to be able to measure it . . . communicate it . . . report it back and easily accessible. • Key indicators would need to be something more finite in nature that you could measure without having differential judgments. • We need a spectrum of indicators; things that people can measure themselves in their daily experience, and then something that takes expertise and some reporting.
	Values	• Indicators should be a value statement. That's the value and then one of the sources of data to indicate how you're doing on that issue.
	Economic	• For some people, that dollar value helps them make that decision. • In a broad sense, [SIs] are a measure of return on investment. However you define investment, however you define return, it differs depending on what the indicator is for.

4) Indicator use and effects Operationalize	Examples of Use	• Example of indicator effect: In 2005, we did [United Way] Compass 2, and 70 some-odd percent of the people said affordable housing was the number one issue . . . we got a five to one return on the amount of dollars that we spent on creating that data that they were able to then leverage into getting money to build some affordable housing within the area. • I think, to some degree, [economic indicators at JEDC] have [shaped policy]. It adds validity to some of the numbers we [CBJ] are coming up with.
	Use in Policy	• Every time there's a decision, you pull out the list of indicators and [see] how you're doing and you say this is how it all fits in. • [SI implementation] has to start at the Assembly level. • We [CBJ Assembly] trot them out to support our favorite project, and this and that, and we use them as sticks to beat on each other. What does staff do apart from listening to our futile wars?
	Use as Information Resource	• They'd be used like essentially sort of baseline data for where the community is at, but it doesn't really get . . . if were working from a consensus as when we built them to start with, the data is going to be not particularly useful. . . it's not going to drive the decision in any sense. • I certainly use [Indicators], for the most part . . . I like to have them as a resource. So, definitely, I . . . read the indicators, and I keep them in the back of my mind for situations that come up in the year in advance.
4) Why original SIs failed?	General Public Support	• [The SIs] are not very well known throughout community. • Person who did them left; . . . [SIs] sort of just sat there . . . If you don't [use them], the indicators will not have a life of their own and go forward beyond the small group that has put [them] together.
	Implementation Plan	• Seemed like a good list, but it was kind of developed in isolation without any kind of implementation plan; without any kind of data collection plan.
	Sustainability Concept	• City management doesn't have a broad sense of sustainability. It's an add-on activity, not part of the culture. No leadership [on sustainability

		issues] in city management.
	Examples or Models	• Good news nationally is that the more cities do develop successful models for this, the more other cities can borrow from.
5) Quality of Life vs. Development "50/50 Divide"	"50/50 Divide"	• 50/50 Divide = 50 percent want development; 50 percent want a quality of life, and they think that development is going to detract from the quality of life, • Intuitively, people are trying to [use sustainability indicators as part of decision making]. The 50/50 divide on things is that people don't share a common understanding or the values behind those indicators haven't been defined or, if not defined, haven't been accepted. • I don't really see [50/50 divide] as a negative connotation. There should be room for healthy discussion.
	SIs provide clarity	• But are we at the 50/50 because we're unable to define as well? Because we lack clear numbers and indicators that allow us to make those decisions?
	SIs won't help	• It's just an ideological divide that is mushy and vague and the middle ground sways this way and that, but it's not from lack of indicators.
6) Complexity	Long-Term Planning	• [On an] issue like how [to] create sustainability factors that will guide decisions for the next 100 years, it's just so hard to get your arms around it that you kind of want to talk about computers again.
	Bounded Rationality	• Money would be better spent for a sustainable community to improve our public transportation system than more LEEDS buildings. But you can't really have that discussion about public transportation because there are just too many factors, and [they are] too ill-defined.
	Tangibility and Public Perception	• Building a more energy efficient building, there are direct and clear outcomes…might not be the most efficient use of resources to go there, but since its defined, we can go there.
	Policy (Bounded Rationality)	• [CBJ Assembly's goals] are sort of like a dashboard. They become essentially indicators [SIs] of what's the policy.

7) Short list of SIs "Dash board"		• If we all have the same document in front of us, makes a tremendous amount of sense
	Public Benefit	• I think the benefit to me of a dashboard is to somebody that's exterior, because Juneau is kind of its own island, and, if you haven't spent time on the island, then you really don't know where we're at, regardless of whether you agree with it or not.
	Educational Tool	• [The CBJ] really just has a handful, and I know that that designates some priority just on what handful is chosen. But if we just have a handful and we integrate them into the process, we learn from those handful and then we start to build and we start to learn and we celebrate our successes and take our knocks and our stumbles accordingly.
8) Barriers to developing SIs	Leadership	• I think Assembly leadership is really key. It comes back to that sort of classic frustration of government being in reactive mode rather than leadership mode. However much you want to be more in the proactive mode, you have to react so fast and so overwhelmingly all the time, that it's very hard to get there.
	Conflicting Dept. Goals	• Organizational units with different goals
	Funding	• Funding [see sustainability fund]
	Unknown	• [SIs] not well known to general public or decision makers
	Additional Workload	• Change; additional work load; procedural vs expedient. • Just measuring [against SIs] requires a lot of work. • Change requires work, and keeping going the way we did from last year doesn't require near as much. So that, to me, is the biggest barrier is that it will cause us to do a lot of work
	Ownership Specialization	• Part of the problem is that nobody takes ownership of [the SIs] because they go through such a broad spectrum of areas . . . If the city were to go through the exercise of generating sustainability indicators every year, only a small portion would be things that they could actually influence the outcome to improve; the rest would be things that somebody else would

		have control over, such as social services, and so it's . . . then you take ownership for that portion that you can improve and you've generated all the indicators, then the social service people have no real ownership in those indicators; even though they look at them, there's no direct ownership of them. Same thing with environmental indicators, the . . . so perhaps the issue is that not one group needs to generate indicators but each area needs to find a home and a group that generates those indicators for their own purposes.
	Procedural vs. Expedient	• One of the things that the city has is that there's a constant tension between procedural and expedient impulses. Assembly members come on and they think hey, I'm going to get something done on my time here and so that's one impulse. • Then there's the planning side, there's a more procedural approach to it so there's that natural conflict. And I think that the trick is, in what are you trying to sustain and what are the indicators that you're focusing on--you probably can get people on a theoretical level to agree on some of those things, but regularly they're gonna want to jump ship.
9) Developing, Reporting, & Evaluation Learning Resilience	Public Involvement	• Community as a whole needs to be a part of this process too because they need to buy into the concepts; otherwise you're not going to have the political support to make those decisions. • We don't have a central vault of information being collected from NGOs, for-profits, government agencies.
	Evaluation	• It almost seems like there needs to be an on-going month-to-month evaluation of functionalities and as you go forth [by which] you look at this stuff constantly off the budget cycle and come up with those directions. • Not a lot of feedback...you're reading the tea leaves.
	Timeframe	• Give yourself two to three years to kind of integrate them into the system, and then build on your strengths and fine tune.

10) Continuum for SI use	Continuum Concept	• There's a continuum of how strongly you use those indicators . . . leaving them on the shelf is one . . . [T]he other extreme is do you try to institutionalize them to the point where they make de facto decisions for you, which I don't think people are going to do. • It's got to be something that is as definitive as possible; something that's a number or a dollar or something, you know--that you can use to justify whatever action you're going to recommend. But it's not going to be something that's automatic.
	Higher Level of Use	• But the first piece is sort of regular dissemination or the education of what they are. [SIs need to be] published regularly or [presented] regularly at Assembly meetings, something like that; that's one step. Another incremental step is sort of a statement by the elected officials of how strongly these should be used, how seriously they should be taken.
	Middle Level of Use	• It'd have to be in the middle somewhere--something that can be used for decision making rather than something that's useless and not used. Something that automatically causes some sort of change. It's got to be something that is as definitive as possible; something that's a number or a dollar or something, you know, that you can use to justify whatever action you're gonna recommend. But it's not going to be something that's automatic.
	Lower Level of Use	• There's a continuum of how strongly you use those indicators . . . leaving them on the shelf is one [end of continuum].
11) Integration into Government Operations	Feedback Loops / Evaluation Learning	• [What] I would like to see done with indicators is to make a better connection between the problem and the proposed solution. For example . . . graduation rates and dropout rates in school; we just keep funding the school system. But [is there] any connection between the funding that we provide and dropout rates? [I]nstitutionalizing the indicators is not a static thing; it's going to be evolving. So, how do you institutionalize the conclusion of community health indicators? I mean that's, I think, the

		goal.
	Staff Decisions	• Hundreds of decisions that staff makes . . . the Assembly never sees.
	Centralized data	• Centralized location for data and SIs
	Purchasing	• Purchasing, you know, there's a huge opportunity there in just buying city supplies--you know, to be evaluating all the time, continuously, what is the impact of this? You still have to have the easily accessible data, but you know, that's the degree of institutionalization that will make a huge difference over time.
	Policy	• Indicators are not systematically integrated into any policy structure.
12) Incrementalism	Status quo v. Change	• Government everywhere is biased toward the status quo. Continue what we are doing. • At this point, it's just kind of the sustained level year to year to year [that] we try to maintain. We try not to increase the mil rate; we hold taxes stable and maintain existing services. • We look at sustainability at the service level; that's our main function . . . [Areas] kind of struggle with their own long-term stability -- chasing dollars back and forth between the programs to what you can afford and what you cannot afford.
13) Weighting indicators		• Get the indicators first and then try to do the political weighting [to have a] chance of being able to monitor and make decisions.
14) Social Domain integration	Nonprofit Organizations	• No real reason why like the United Way and the JEDC, who are trying to do economic . . . indicators for the community, couldn't be also part of a structural process within the city of developing this report, and each one have the same one instead of everybody doing it separately. Theoretically, costs should go down; I mean, to have JEDC just integrated into that structure so that we know we go to JEDC for this data and then [the Deputy City Manager] calls up whoever to get some data or the latest data on something. Then there's a structure that they're a part of, because it can't just be the city all by itself--you've got to involve your other organizations and your business community. That's the ultimate goal

		is to have the whole community engage.
	Loss of Social Dimension	• I think that [the elimination of the CBJ Social Services Department] was a real loss, because it was a dimension that was never included in the other decisions. So, we couldn't have a real true consideration of the health, well being, economic, whatever health without that piece.
15) Program Performance vs SIs		• We don't have good performance indicators. • Not feeding back into the system. • Outcome indicators vs output; but not outcomes.
16) Organizational Structure	Green Team Transfer of Knowledge	• CBJ's interdivisional Green Team • Transfer of knowledge [regarding SIs] didn't happen. [If staff works on revising indicators] is a [CBJ] internal issue.
17) Data Collection	Privatization Public Input	• Hiring a consultant, sometimes you end up with a product that is already unsustainable because we can't continue to hire that person to do it. If you do the dashboard it should be simple enough that volunteers can do the work and we maybe centralize the grunt labor with JEDC. • Impact to neighborhoods… kinds of things not measured.
18) Operational	Education Ownership Political Support	• New assembly members who have never seen the Comp Plan, won't read it, don't understand how important it is, don't even know there's a Sustainability Commission, don't have a clue. It's almost like we need to have this <u>educational process</u> as part of being an Assembly member . . .[T]hey've made campaign promises. • May not have been part of the decision making process, so…no ownership. • I'll guarantee you that if the Assembly, once a month, says where's that darn Comprehensive Plan and what are we doing on it, it would have an impact on the Comprehensive Plan.
20) Policy alignment	Alignment Communication	• There seems to be also kind of a missing link between the city organization and setting that overall goal or vision direction for the community, and then communicating • that information to other organizations, like the Hospital and the School District, the University.

21) "silo"ing	Examples	• I think [with] so many of these things we are doing the silo kind of thing; just looking at that one indicator and whether or not it's sustainable. • A kind of silowing is the harbor master gets death threats for wanting to raise fees for mooring your boat to develop a new financial funding plan to replace their infrastructure.
	Trade offs – holistic approach	• You're preserving one environmental value; you're probably destroying several others at the same time. You really have to look at everything simultaneously.
	Interagency Dimension	• If a sustainability indicator is to be useful, then it would probably have to have an interagency dimension to it. It can't be a silo thing because some of the other key players are going to have to buy into that also.
	Complexity	• As a community grows, by necessity it has to compartmentalize, I think. I think that's what happened. I mean, you go to the small communities in Alaska and they . . . have one governing body and one government that controls everything. But the bigger you get the more you compartmentalize things.
Demographics	Young people leaving	• We are aging . . . not keeping our young people
Scale	Community v Region	• We should be really thinking about not just Juneau but also our region.
	Population Decline	• I think the region is absolutely important and over the last few years, in the media, it was splattered about the outmigration for rural Alaska to urban Alaska . . . Worst population declines are right in SE – period. It's really worrisome, it's very worrisome [retirees] decline in population.

Appendix 7. Juneau 2008 Draft Sustainability Indicators Framed as Five Domains

Social and Cultural	• Capacity of pre-school & classroom size • Adult literacy rate • Dropout rate, by ethnicity • Average college entrance scores • Number attending college • Percent population in cultural arts • Homeless housing and support • Child care availability & costs • Emergency services response time • Access to health care • Percent of healthy births & child immunizations • Incidents of crime by type • Number of charitable organizations, volunteer hours, and annual budgets
Environmental	• Relative sea rise and affected public and private structures • Noise levels • Safe water and air quality – number of violations (air and water) • Scenic corridors for water & mountains • Scenic corridors to harbors, historic landmarks • Amount & location of developed coastline • Number of fish and wildlife species • Number of dirty water bodies • Water quality – fresh and marine • Number of food conditioned bear kills • Number of acres of altered vegetation, streams, & structures w/in habitat • Number & miles of publicly accessible trails • Number & acreage of shoreline parks & accessible boat launch facilities
Economic	• Housing for all – vacancy rate by price • Living wage – estimated household budget • Percent households without medical benefits • Percent of households paying more than 50% of gross income on shelter costs • Job longevity • City revenue and operating expenses • Per capita cost of public services • Per capita debt ratio • Retain Alaska State Capital in Juneau • Employment opportunity & diversity • Private sector capital availability • Percent of goods produced locally • Price of nonrenewable fuels • Academic programs matched to job market
Public Policy-Related	• Number of public gathering places downtown and neighborhoods • Number of neighborhood associations and civic groups • Percent of population that use public transit • Streets with formal bike lanes

	• Amount of solid waste land filled, reused and recycled material • Police and firefighters per 1,000 population • Staff per acre of parks & rec. facilities • Average density of developed & vacant land within ¼ mile of bus service
Technological	• Percent of alternative energy consumption (other than liquid fuels) • Research, application, and education in alternative energy consumption • Education – alternative energy, conservation, longer term planning, building tech.